

Return to
LIBRARY
DEPARTMENT
~~~~~  
NATIONAL BUSINESS  
PUBLICATIONS LIMITED











# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. I.

OTTAWA, JANUARY 31st, 1903.

Vol. XXII—No. I.



**THE CANADIAN RAND DRILL CO**  
SHERBROOKE, QUE.  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.





ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co

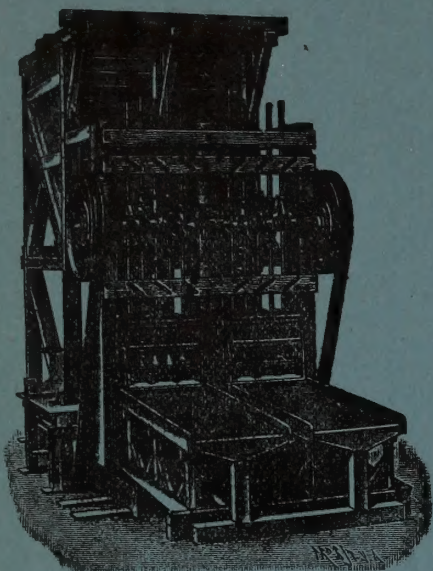
ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

Agents:

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

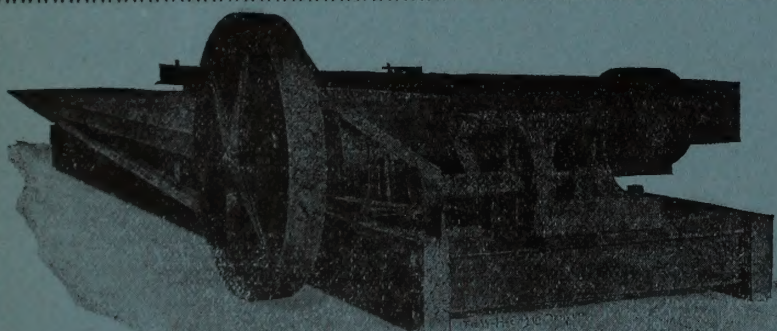
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.



TWENTY-FIRST YEAR OF PUBLICATION



# The Canadian MINING REVIEW

Established 1882

An Illustrated Monthly Journal of Information for Mine Managers and Mining Engineers.

THE OLDEST AND ONLY OFFICIAL AND ENGINEERING  
JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

EDITED AND PUBLISHED BY

B. T. A. BELL

Royal Commissioner on Yukon Hydraulic Concessions  
Secretary of The Canadian Mining Institute  
Secretary of The General Mining Association of Quebec  
Secretary of The Ontario Mining Protective Association  
Secretary Canadian Mica Miners' Association

---

1903

Volume XXII.

Editorial Offices:—ORME'S HALL, OTTAWA, CANADA.



# INDEX TO CONTENTS.

|                                                                             | PAGE            |                                                                             | PAGE                                        |                                                                            | PAGE                          |
|-----------------------------------------------------------------------------|-----------------|-----------------------------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------------------|-------------------------------|
| A Danger Ahead.....                                                         | 202             | Canadian American Coal and Coke Co.....                                     | 39                                          | Dredges, Their Construction and Manipulation.....                          | 17                            |
| A Few Suggestions on Mineral Statistics.....                                | 44              | Canadian Chromite.....                                                      | 222                                         | Dredging Gold, in British Columbia.....                                    | 148                           |
| A Minister of Mines Wanted for Canada.....                                  | 26              | Canadian Graphite.....                                                      | 140                                         | Dredging, Gold, in New Zealand.....                                        | 172                           |
| A Modern Coarse Concentration Plant for Silver Lead Ores.....               | 11              | Canadian Iron and Steel Bounties.....                                       | 178                                         | Dredging, Gold, in United States.....                                      | 101                           |
| Aerial Transmission at the Tye Copper Mine.....                             | 160             | Canadian Lead Bounties.....                                                 | 176                                         | Dredging Gold, The Ogilvie Company.....                                    | 55 252                        |
| Air Compression by Water Power.....                                         | 50              | Canadian Mining Institute.....                                              | 7-31-58-146-231                             | Dredging, In Oroville, California.....                                     | 211                           |
| Alberta Railway and Coal Company.....                                       | 39              | Canadian Mining Review, Burnt Out.....                                      | 123                                         | Drilling, Cost of Electric.....                                            | 125                           |
| Alluvial Mining in Nova Scotia.....                                         | 188             | Canadian Minister of Mines, A.....                                          | 26                                          | Dry Process for the Treatment of Complex Sulphide Ores.....                | 206                           |
| Aluminum.....                                                               | 168             | Canadian Oil Exploration Co., Ltd.....                                      | 97                                          | Duggan, G. H.....                                                          | 80                            |
| American Institute of Mining Engineers.....                                 | 110             | Canadian Portland Cement Companies.....                                     | 218                                         | Duty on Yukon Mining Machinery, Removal of.....                            | 110                           |
| American Iron and Steel Association.....                                    | 221             | Canadian Rockies, Mining Possibilities of the.....                          | 81                                          |                                                                            |                               |
| Anglo Canadian Gold Estates.....                                            | 28              | Canadian Smelting Works.....                                                | 74                                          |                                                                            |                               |
| Anglo-Klondike Mining Co.....                                               | 73-253          | Canadian Smelting Works, New Assay Plant of the.....                        | 20                                          |                                                                            |                               |
| Another Prospectus re Grenville Graphite Co.....                            | 43              | Canadian Trade in Mining and Smelting Machinery.....                        | 7-28-76-100-125-147-166-236                 | Economic Geography.....                                                    | 89                            |
| Anthracite Coal—The Production of.....                                      | 220             | Canadian Westinghouse Company.....                                          | 220                                         | Electric Drilling, The Cost of.....                                        | 125                           |
| Arlington Mine, (Erie, B. C.).....                                          | 214-238-243     | Cape Breton, Close of the Year in.....                                      | 241                                         | Electrolytic Lead Refining at Trail, B. C.....                             | 153                           |
| Asbestos.....                                                               | 81-110-223      | Cape Breton Coal and Iron Co.....                                           | 23-140-253                                  | Elevation of Tailings by Compressed Air.....                               | 150                           |
| Asbestos Mining in Asiatic Russia.....                                      | 110             | Cape Breton Mining Co.....                                                  | 39                                          | "En Passant".....                                                          | 167-189-220-249               |
| Assay Office Vancouver—Gold Bullion handled at.....                         | 23              | Cariboo Consolidated Mining Company.....                                    | 160                                         |                                                                            |                               |
| Assay Plant, Canadian Smelting Works.....                                   | 20              | Cariboo, McKinney Mine, The.....                                            | 37                                          | Fake Mining Meeting in Toronto.....                                        | 38                            |
| Athelston Mine—The.....                                                     | 197             | Carter, W. E. H., on "Peat Fuel, Its Manufacture and Use".....              | 113                                         | Famous Old Spanish Mines.....                                              | 256                           |
| Atlin Mining District.....                                                  | 221             | Cartoon, Political Navigation on Rainy River.....                           | 40                                          | Eernie Strike, The.....                                                    | 26-76                         |
| Australian Production of Copper.....                                        | 240             | Cataract Power Co.....                                                      | 220                                         | Forrest, B. J., on "Mine Development Methods".....                         | 131                           |
|                                                                             |                 | Cement Companies, Canadian.....                                             | 218                                         | Fowler, S. S., on "Southern British Columbia".....                         | 3                             |
| B. C. Exploring Syndicate.....                                              | 73              | Centre Star Mining Co.....                                                  | 243-250                                     | Frank Disaster, The.....                                                   | 102-121                       |
| Bell, B. T. A.....                                                          | 165             | Chalmers, The Late Mr. Thomas.....                                          | 168                                         | Free Coal, The Question of.....                                            | 8                             |
| Bells Asbestos Co.....                                                      | 81              | China, Mining Concessions in.....                                           | 235                                         | Future of the Dominion Coal and Steel Companies.....                       | 99                            |
| Belmont Gold Mine.....                                                      | 182             | Chromite, Canadian.....                                                     | 222                                         |                                                                            |                               |
| Belmont Gold Mine—Air Compression at the.....                               | 50              | Coal, The Production of Anthracite.....                                     | 220                                         | Geography, Economic.....                                                   | 89                            |
| Bendigo Gold Fields—Synclinal Reefs at the.....                             | 168             | Coal, The Question of Free.....                                             | 8                                           | Geological Survey of Canada.....                                           | 201                           |
| Betts—Anson G.—on "Electrolytic Lead Refining at Trail, B. C.".....         | 153             | Coal and Iron Returns, Canada, 1902.....                                    | 39                                          | Geological Survey, Discussion on in House of Commons.....                  | 156                           |
| Big Master Gold Mine.....                                                   | 97              | Coal Cutting Machinery.....                                                 | 139                                         | German Consumption of Foreign Copper.....                                  | 168-189                       |
| Blair, David K., on "Gold Dredges—Their Construction and Manipulation"..... | 17              | Coal in Ontario.....                                                        | 168                                         | Gold Bullion, Handled at Vancouver Assay Office.....                       | 23                            |
| Blakemore, Wm., on "The Question of Free Coal".....                         | 81              | Coal Output of New Zealand.....                                             | 235                                         | Gold Dredge, A New.....                                                    | 215                           |
| Blakemore, Wm., on "The Frank Disaster".....                                | 121             | Coal Production of British India.....                                       | 234                                         | Gold Dredge, The Stewart River.....                                        | 55-252                        |
| Blast Furnace Laboratory, The Modern.....                                   | 47              | Coal Production of N. W. Territories.....                                   | 232                                         | Gold Dredges, Their Construction and Manipulation.....                     | 17                            |
| Book Reviews.....                                                           | 229             | Coal Supply of the United Kingdom.....                                      | 189                                         | Gold Dredging in British Columbia.....                                     | 148                           |
| Bosun Mines, Ltd.....                                                       | 182-184         | Coarse Concentration Plant, for Silver Lead Ores.....                       | 12                                          | Gold Dredging in New Zealand.....                                          | 172                           |
| Boundary District, B. C., Mining and Smelting in the.....                   | 10              | Cobolt-Nickel Arsenides and Silver in Ontario.....                          | 244                                         | Gold Dredging in United States.....                                        | 101                           |
| Boundary District, B. C., Shipments from the.....                           | 197             | Coke Shipments, Crow's Nest Pass Co.....                                    | 97                                          | Gold Dredging in United States, Notes on.....                              | 35                            |
| Bounties, Iron and Steel, Canada.....                                       | 146-178         | Colliery Manager, The Training of a.....                                    | 21                                          | Gold Dredging Company, The Ogilvie.....                                    | 252                           |
| Bounties, Lead, Canada.....                                                 | 146-168-156-221 | Colonial Copper Co.....                                                     | 74                                          | Gold and Manganese Mining in B. C.....                                     | 256                           |
| Bounties, Iron, Newfoundland.....                                           | 184             | Companies, New Mining.....                                                  | 23-182-198-213-237-252                      | Gold Mining in Nova Scotia.....                                            | 30                            |
| Brent, Charles, M. E., on "Notes on the Gold Ores of Western Ontario".....  | 33              | Company Notes.....                                                          | 23-41-73-97-123-141-160-182-197-213-237-253 | Gold Mining in Nova Scotia, Deep.....                                      | 217                           |
|                                                                             |                 | Complex Sulphide Ores. Treatment of.....                                    | 206                                         | Gold Milling Costs.....                                                    | 205                           |
| BRITISH COLUMBIA:                                                           |                 | Compressed Air in the Elevation of Tailings.....                            | 150                                         | Gold Ores of Western Ontario, Notes on.....                                | 33                            |
| Atlin District.....                                                         | 221             | Concentrates.....                                                           | 183-214 239-254                             | Gold Output in the Transvaal.....                                          | 235                           |
| Boundary District.....                                                      | 197             | Concentration of Iron Ores, Progress of Magnetic.....                       | 134                                         | Gold, World's Production in 1902.....                                      | 233                           |
| Building Materials.....                                                     | 129             | Congress, American Mining.....                                              | 231                                         | Granby Consolidated Mining, Smelting and Power Company.....                | 37-97-138-182-197-214-232-238 |
| Coal.....                                                                   | 127             | Consolidated Lake Superior Co.....                                          | 166-221-237-254                             | Grand Trunk Pacific, The.....                                              | 167                           |
| Copper.....                                                                 | 129             | Cooper, The late Mr. James.....                                             | 145                                         | Graphite.....                                                              | 7-43-140                      |
| General Development in 1902.....                                            | 130             | Copper, German Consumption of Foreign.....                                  | 168-189-220                                 | Graphite, Canadian, H. P. H. Brumell.....                                  | 140                           |
| Gold Mining in.....                                                         | 128             | Cornish Tin Mining, The Decline of.....                                     | 233                                         | Graphite, the Walker Deal.....                                             | 25                            |
| Gold Dredging in.....                                                       | 128-148         | Cost of Electric Drilling, The.....                                         | 125                                         | Green, Raoul, on "The Frank Disaster".....                                 | 103                           |
| Gold and Manganese Mining in.....                                           | 255             | Coste, Eugene, M. E., on "A few suggestions on Mineral Statistics".....     | 44                                          | Grenville Graphite Company.....                                            | 43                            |
| Hydraulic in.....                                                           | 128             | Costs, Gold Milling.....                                                    | 205                                         | Griffiths, André P. on "Cyaniding of Some Silver Ores by Percolation"..... | 223                           |
| Iron Ore.....                                                               | 129             | Craig, W. Dixon, on "The Modern Blast Furnace Laboratory and its Work"..... | 47                                          |                                                                            |                               |
| Lead Refining at Trail.....                                                 | 5               | Crow's Nest Pass Coal Company.....                                          | 39-97-112-119-125-141-182-238-254           | Haanel, Dr. Eugene, on "Mining Progress in the Yukon in 1902".....         | 110                           |
| Lead Shipments.....                                                         | 214             | Cuba, Mining in.....                                                        | 240                                         | Hall Mining and Smelting Co.....                                           | 237                           |
| Lode Gold Mining.....                                                       | 128             | Cumberland Railway and Coal Co.....                                         | 139-253                                     | Hamilton Steel and Iron Co.....                                            | 39                            |
| Manganese Mining in.....                                                    | 255             | Cundy, W. H., "Saddle Reefs" Bendigo Gold-fields.....                       | 168                                         | Hand Sorting vs. Milling.....                                              | 243                           |
| Metalliferous Mining in.....                                                | 217             | Cyaniding Some Silver Ores by Percolation.....                              | 223                                         | Hastings, (B. C.) Exploration Syndicate.....                               | 198-253                       |
| Mining in Southern, in 1902.....                                            | 3               |                                                                             |                                             | Hints for Investors.....                                                   | 236                           |
| Mining in, 1902.....                                                        | 126             | Danger Ahead, A.....                                                        | 202                                         | Hobart, Frederick, on "Some Possibilities of Mining in Canada".....        | 46                            |
| Mining and Smelting in the Boundary District.....                           | 10              | Dark Hour of the Dominion Iron and Steel Co.....                            | 75                                          | Hobson, John B. M. E., on "Cost of Electric Drilling".....                 | 125                           |
| Other Minerals of.....                                                      | 129             | Deep Gold Mining in Nova Scotia.....                                        | 217                                         | Hooley Scardal, The.....                                                   | 167                           |
| Poplar Creek Gold Discoveries.....                                          | 189             | Deseronto Iron Co.....                                                      | 39                                          | Horsley, S., M. E., on "Gold Milling Costs".....                           | 205                           |
| Royalty Tax in.....                                                         | 8               | Development of Gold Dredging in the United States.....                      | 35                                          | Howley, J. P., on "Mining in Newfoundland".....                            | 95                            |
| Silver and Lead in.....                                                     | 129             | Development Methods, Mine.....                                              | 131                                         |                                                                            |                               |
| Southern B. C., in 1902.....                                                | 3               | De Zamboria, Stephen, on "Rope Tramways".....                               | 222                                         | India, The Coal Production of British.....                                 | 234                           |
| Trail, Lead Refining at.....                                                | 5               | Dominion Assay Office, Vancouver.....                                       | 23                                          | Imports of Mining Machinery.....                                           | 7-28-76-100-125-147-166-236   |
| British Columbia, (Rossland and Slocan Syndicate).....                      | 253             | Dominion Coal Co.....                                                       | 91-120-185-198-237-238-253                  | Imports of Wire Rope, Canada.....                                          | 28-166-236                    |
| Brookfield Mining Co., (N.S.).....                                          | 253             | Dominion Coal and Steel, The Future of.....                                 | 99                                          | Intercolonial Coal Mining Co.....                                          | 39                            |
| Bruce Copper Mines.....                                                     | 238             | Dominion Iron and Steel Co., "The Dark Hour of the".....                    | 75                                          | International Coal and Coke Co.....                                        | 123-141-182-237               |
| Brumell, H. P. H., on "Canadian Graphite".....                              | 140             | Dredge, A New Gold.....                                                     | 215-1                                       | Inverness Ry. and Coal Co.....                                             | 39-182                        |
| "Burnt Out," The Canadian Mining Review.....                                | 123             | Dredge, The Stewart River Gold.....                                         | 55-252                                      | Investors, Hints for.....                                                  | 236                           |
|                                                                             |                 |                                                                             |                                             | Iowa Lilloet Gold Mining Co.....                                           | 97                            |
| California State Miners Association.....                                    | 231             |                                                                             |                                             | Iron and Steel Bounties, Canada.....                                       | 146-178                       |
| Camp Bird Mine, The.....                                                    | 237             |                                                                             |                                             |                                                                            |                               |
| Canada Coals and Railway Co.....                                            | 39              |                                                                             |                                             |                                                                            |                               |
| Canada Corundrum Co.....                                                    | 182             |                                                                             |                                             |                                                                            |                               |
| Canada Iron Furnace Co.....                                                 | 39              |                                                                             |                                             |                                                                            |                               |
| Canadian Amber Mica Co.....                                                 | 141             |                                                                             |                                             |                                                                            |                               |



# INDEX—Continued.

|                                                                                                        | PAGE                            |                                                                                                    | PAGE               |                                                                                                 | PAGE               |
|--------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------------------|--------------------|
| Iron and Steel Industries of Canada.....                                                               | 143                             | McNeill Co., The W. H.....                                                                         | 39                 | "Saddle Reefs" of the Bendigo Goldfields.....                                                   | 168                |
| Iron and Steel Institute of G.B.....                                                                   | 231                             | New Brunswick Petroleum Co.....                                                                    | 238                | Sapphire Corundrum Co., The.....                                                                | 182                |
| Iron Bounties, Newfoundland.....                                                                       | 184                             | New England and Canadian Asbestos Co.....                                                          | 141                | Shields, Mr. Cornelius.....                                                                     | 77                 |
| Iron Ore and the Tariff.....                                                                           | 163                             | New Fairview Corporation, The.....                                                                 | 141                | Shipments, Rossland Ore.....                                                                    | 214                |
| Iron Ore, Progress of the Magnetic Concentra-<br>tion of.....                                          | 134                             | Newfoundland Iron Bounties.....                                                                    | 184                | Silver, The price of, 1902.....                                                                 | 220                |
| Iron, Pig, Production of, In Canada.....                                                               | 124                             | New Goldfields of British Columbia.....                                                            | 95                 | Silver King Mine, The.....                                                                      | 182                |
| Iron Trade, Ontario and the.....                                                                       | 123                             | New Zealand, Coal Output.....                                                                      | 96                 | Silver Lead Ores, "A Modern Plant for the<br>Concentration of Coarse".....                      | 11                 |
| Ivanhoe Mine, The.....                                                                                 | 197                             | New Zealand, Gold Dredging in.....                                                                 | 235                | Silver Ores, "Cyaniding of Some".....                                                           | 223                |
| Johnson, James, on "The Mineral Production<br>of Canada and United States".....                        | 93                              | New Zealand, Paternal Legislation in.....                                                          | 172                | Slough Creek Mines, The.....                                                                    | 23                 |
| Kerr, D. G., on "Air Compression by Water<br>Power at the Belmont Mine".....                           | 50                              | Nickel.....                                                                                        | 73                 | Smelter, The Granby.....                                                                        | 37                 |
| Knox, Newton Booth, on "Dredging and valu-<br>ing Dredging Ground in Oroville, Cali-<br>fornia.....    | 211                             | Nickel, Cobalt, Ontario.....                                                                       | 245                | Smelter, The Tyee.....                                                                          | 146                |
| Kootenay Mine, The.....                                                                                | 197                             | Nickel Plate Mine.....                                                                             | 141                | Smelting, Boundary District, 1902.....                                                          | 10                 |
| Labor Crisis in the Transvaal, The.....                                                                | 234                             | Nineteenth Century, The Mineral Industry, in<br>the.....                                           | 190                | Smelting Costs, Lead.....                                                                       | 139                |
| Lake Superior Consolidated Co.....                                                                     | 166-221-237-254                 | Northwestern Smelting and Refining Co.....                                                         | 182                | Smith, Frank B., on "Mining in the North-<br>West in 1902".....                                 | 30                 |
| Lead Bounties, Canadian.....                                                                           | 146-168-176-221                 | North Star Mining Co.....                                                                          | 159                | Smith, Frank B., on "The Frank Disaster".....                                                   | 102                |
| Lead Bullion, The Refining of.....                                                                     | 151                             | Notes on the Gold Ores of Western Ontario.....                                                     | 33                 | Snowshoe Gold and Copper Mines, Ltd. 24-141-214                                                 | 231                |
| Lead, Pig, The World's Production of.....                                                              | 239                             | Notes on the History of the Mineral Industry<br>in the 19th Century.....                           | 190                | Society of Chemical Industry.....                                                               | 231                |
| Lead Refining at Trail, B.C.....                                                                       | 5-153                           | Notes on the Training of a Colliery Manager.....                                                   | 21                 | Some Notes, on Roasting with the McDougall<br>Furnace.....                                      | 87                 |
| Lead Refining, Electrolytic.....                                                                       | 153                             | NOVA SCOTIA:                                                                                       |                    | "Some Possibilities of Mining in Canada.....                                                    | 46                 |
| Lead Shipments, B.C.....                                                                               | 215                             | Alluvial Mining in.....                                                                            | 188                | Sorenson, Severin S., on "Some Notes on<br>Roasting with the McDougall Furnace".....            | 87                 |
| Lead Smelting Costs.....                                                                               | 139                             | Cape Breton, Close of the year in.....                                                             | 241                | Souris Coal Mining Co.....                                                                      | 39                 |
| Leckie, Major R. G.E.....                                                                              | 220-245                         | Deep Gold Mining in.....                                                                           | 217                | Southern British Columbia in 1902.....                                                          | 3                  |
| Legislation, Mining.....                                                                               | 100                             | Gold Mining in.....                                                                                | 30                 | Spanish Mines, Famous Old.....                                                                  | 256                |
| LeRoi Mine.....                                                                                        | 28 71 141-182-237-253           | Gold Ores, Thefts of in.....                                                                       | 174                | Stamps and their Increasing Power.....                                                          | 126                |
| LeRoi No. 2.....                                                                                       | 73-160-198                      | Manganese in.....                                                                                  | 204                | Stamp Mills.....                                                                                | 126                |
| Library, Canadian Mining Institute, Removal<br>of.....                                                 | 146                             | Mining in, 1902.....                                                                               | 2                  | Statistics, Mineral, A Few Suggestions on.....                                                  | 44                 |
| Lillooet, Fraser River and Cariboo Gold Fields                                                         | 74                              | Mining Legislation in.....                                                                         | 100                | Stewart River Gold Dredge, The.....                                                             | 55-252             |
| London and British Columbia Gold Fields. 23-123                                                        |                                 | Mining Progress in.....                                                                            | 144                | Strike at Fernie, The.....                                                                      | 26-76              |
| Mabou Coal Mining Co.....                                                                              | 41                              | Mining Society of.....                                                                             | 230                | Sulman, H. Livingston, on "A Dry Process<br>for the Treatment of Complex Sulphide<br>Ores"..... | 205                |
| Magnetic Concentration of Iron Ore, Progress<br>of.....                                                | 134                             | Thfts of Gold Ores in.....                                                                         | 174                | Sultana Island The Ophir Mine.....                                                              | 37                 |
| Malay Tin and Ontario Nickel.....                                                                      | 164                             | Nova Scotia Collieries, Ltd.....                                                                   | 123-131            | Sydney Dry Dock, The.....                                                                       | 197                |
| Manganese and Gold Mining in B.C.....                                                                  | 255                             | Nova Scotia Mining Society.....                                                                    | 230                | Tailings, Elevation of, By Compressed Air.....                                                  | 150                |
| Manganese in Nova Scotia.....                                                                          | 204                             | Nova Steel and Coal Co.....                                                                        | 39-182-198-253-254 | Tamarac Mine, (B.C.), The.....                                                                  | 237                |
| Maritime Coal Mining Co.....                                                                           | 139                             | Ogilvie Gold Dredging Co.....                                                                      | 252                | Tariff, Iron Ore and the.....                                                                   | 163                |
| Martin, Hon. Archer, "Mining Cases".....                                                               | 112                             | Oldfield, Frank W., on "The Cyaniding of<br>Some Silver Ores by Percolation".....                  | 223                | Thefts of Gold Ores in Nova Scotia.....                                                         | 174                |
| Metal Trades, The.....                                                                                 | 236                             | Old Spanish Mines, Famous.....                                                                     | 256                | Tilt Cove Copper Company.....                                                                   | 214                |
| Metalliferous Mining in B.C.....                                                                       | 217                             | ONTARIO:                                                                                           |                    | Trail Smelter.....                                                                              | 97-213             |
| Mica Boiler Covering Co, The.....                                                                      | 23                              | And the Iron Trade.....                                                                            | 123                | Trail (B.C.), Lead Refining at.....                                                             | 5                  |
| Mikado Gold Mining Co.....                                                                             | 73-97-112                       | Coal in.....                                                                                       | 168                | Training of a Colliery Manager.....                                                             | 21                 |
| Miller, Willet G., on "Cobalt Nickel Arsen-<br>ides in Ontario".....                                   | 244                             | Fake Mining Meeting, Toronto.....                                                                  | 38                 | Tramways, Rope.....                                                                             | 222                |
| Miller, Willet G., "Notes on the History of<br>the Mineral Industry in the Nineteenth<br>Century"..... | 190                             | Gold Ores of Western, Notes on the.....                                                            | 33                 | Transvaal Labor Crisis.....                                                                     | 234                |
| Milling Costs, Gold.....                                                                               | 205                             | Growing Mineral Industry of.....                                                                   | 185                | Treatment of Complex Sulphide Ores, A.....                                                      | 206                |
| Mine Development Methods.....                                                                          | 131                             | Iron Trade, The.....                                                                               | 123                | Tyee Copper Company.....                                                                        | 141-157-160        |
| Mineral Industry, Ontario's Growing.....                                                               | 185                             | Minerals of.....                                                                                   | 188-189            | Tyee Smelter.....                                                                               | 147                |
| Mineral Fuel, Canada.....                                                                              | 255                             | Mineral Output of 1903.....                                                                        | 189                | United Goldfields of British Columbia.....                                                      | 97                 |
| Mining, Alluvial in Nova Scotia.....                                                                   | 188                             | Mining in, 1902.....                                                                               | 1                  | UNITED STATES:                                                                                  |                    |
| Mining, Metalliferous in British Columbia.....                                                         | 217                             | Nickel and Malay Tin.....                                                                          | 164                | Gold Dredging in the.....                                                                       | 101                |
| Mineral Production, Canada and U. S.....                                                               | 93                              | Notes on the Gold Ores of Western.....                                                             | 33                 | Mineral Production, Canada and the.....                                                         | 92                 |
| Mineral Shipments over Quebec Central Ry.....                                                          | 23                              | Peat Fuel, Its Manufacture and Use.....                                                            | 113                | Notes on the Development of Gold Dredg-<br>ing in the.....                                      | 35                 |
| Mineral Statistics, A few Suggestions on.....                                                          | 44                              | The Year 1902, in.....                                                                             | 1                  | Valuing Dredging Ground in Oroville Cali-<br>fornia.....                                        | 211                |
| Mining and Smelting in the Boundary District.....                                                      | 10                              | Ophir Mine.....                                                                                    | 37                 | Velvet-Rossland Company.....                                                                    | 97-138-160-182-253 |
| Mining, In British Columbia.....                                                                       | 126                             | Ore Shipments, Boundary District.....                                                              | 238                | Vogelstein, L., "German Consumption of For-<br>eign Copper".....                                | 168-189-220        |
| Mining, In Canada.....                                                                                 | 46                              | Ore Shipments, Rossland District.....                                                              | 237                | Wabana Ores of the Dominion Iron and Steel<br>Company.....                                      | 168                |
| Mining, In Newfoundland.....                                                                           | 95                              | Passing of Prosperity, The.....                                                                    | 201                | Wade, F. B., M.P., "Thefts of Gold Ores in<br>Nova Scotia.....                                  | 174                |
| Mining, In Northwest Territories.....                                                                  | 30                              | Payne Consolidated Mining Co., Ltd., The.....                                                      | 118                | Walker Graphite Deal, The.....                                                                  | 25                 |
| Mining, In Nova Scotia.....                                                                            | 2                               | Peat Fuel, Its Manufacture and Use.....                                                            | 113                | Walker Mining Company.....                                                                      | 7                  |
| Mining, In Ontario.....                                                                                | 1                               | Personal Mention.....                                                                              | 183-198-238-249    | War Eagle Consolidated Mining Co.....                                                           | 41-182             |
| Mining, In Philippine Islands.....                                                                     | 234                             | Phillipines, Mining in the.....                                                                    | 234                | Waterloo Mine The.....                                                                          | 182                |
| Mining Cases, by Hon. Archer Martin.....                                                               | 112                             | Picard, Hugh Kirkpatrick, on "A Dry Process<br>for the Treatment of Complex Sulphide<br>Ores"..... | 206                | Wells, J. Walter, on "Molybdenite Its Occur-<br>rence, Concentration and Uses".....             | 113                |
| Mining Companies, New.....                                                                             | 23-182-198-213-237-252          | Piddington, F. L., on "The Refining of Lead<br>Bullion.....                                        | 151                | Wells, J. Walter, on "Progress of the Mag-<br>netic Concentration of Iron Ore".....             | 134                |
| Mining Concessions in China.....                                                                       | 235                             | Pig Iron, Production of, In Canada.....                                                            | 124                | West Canadian Collieries, Ltd.....                                                              | 97                 |
| Mining Congress, The American.....                                                                     | 231                             | Pig Lead, World's Production of.....                                                               | 239                | Western Fuel Company.....                                                                       | 214                |
| Mining Institute, The Canadian.....                                                                    | 7-31-58 231                     | Poplar Creek, (B.C.) Discoveries.....                                                              | 189                | Western Ontario, Notes on the Gold Ores of.....                                                 | 33                 |
| Mining Legislation in Nova Scotia.....                                                                 | 100                             | Portland Cement Companies, Canadian.....                                                           | 218                | Wet-tinghouse Company, the Canadian.....                                                        | 220                |
| Mining Machinery, Canadian Imports of.....                                                             | 7-28-76-<br>100-125-147-166-236 | Posthwaite, R. H., on "Gold Dredging in<br>the U.S.".....                                          | 101                | White, James, on "Economic Geography".....                                                      | 89                 |
| Mining Machinery in the Yukon, Removal of<br>Duty on.....                                              | 110                             | Pratt, Joseph Hyde on "Asbestos".....                                                              | 225                | Whitewater Mines, Ltd.....                                                                      | 23                 |
| Mining Possibilities of the Canadian Rockies.....                                                      | 81                              | President Gold Mining Company.....                                                                 | 198                | Wilcox Mine, Ymir, B.C.....                                                                     | 237-238            |
| Mining Progress in Nova Scotia.....                                                                    | 230                             | Prices of Silver.....                                                                              | 220                | Winnipeg Mine, The.....                                                                         | 197-214            |
| Mining Society of Nova Scotia.....                                                                     | 230                             | Quebec Central Ry., Mineral Shipments, 1902.....                                                   | 23                 | Wire Rope, Canadian Imports of.....                                                             | 28-236             |
| Minister of Mines for Canada.....                                                                      | 26                              | Radium.....                                                                                        | 164                | Wire Rope Tramway Installations.....                                                            | 97                 |
| Minister of Mines, "An Ontario".....                                                                   | 38                              | Redmayne, R. A. S., on "Training of a Colliery<br>Manager".....                                    | 21                 | Woakes, Ernest R., on "A Modern Coarse<br>Concentration Plant for Silver Lead Ores".....        | 11                 |
| Modern Blast Furnace Laboratory and Its<br>Work, The.....                                              | 47                              | Refining, Lead, At Trail, B.C.....                                                                 | 5                  | World's Production of Gold, 1902.....                                                           | 233                |
| Molly Gib-on Mine, The.....                                                                            | 238                             | Refining of Lead Bullion, The.....                                                                 | 151                | Wright, Whittaker.....                                                                          | 221                |
| Molybdenite, Its Occurrence, Concentration<br>and Uses.....                                            | 113                             | Reorganization of the Geological Survey, The 156-<br>202.....                                      | 202                | Wylie, Wm., on "Gold Dredging in New<br>Zealand".....                                           | 172                |
| Mond Nickel Company, The.....                                                                          | 73                              | Rio Tinto Mine, The.....                                                                           | 233                | Ymir Mine Limited.....                                                                          | 23-41-182-237-253  |
| Monitor and Ajax Fraction, Ltd.....                                                                    | 97                              | Robinson, A. W., on "The Stewart River Gold<br>Dredge".....                                        | 55                 | Yukon Mining Machinery, Removal of Duty<br>on.....                                              | 110                |
| Montague, Ralph L., on "The Development<br>of Gold Dredging in the United States.....                  | 35                              | Rope, Canadian Imports of Wire.....                                                                | 28-236             | Yukon, The Treadgold Royal Commission.....                                                      | 165                |
| Morrison Mines, The.....                                                                               | 74                              | Rope Tramways.....                                                                                 | 222                | Zenith Zinc Mine.....                                                                           | 214                |
| McDonald, Bernard, on "Mining Possibilities<br>of the Canadian Rockies.....                            | 81                              | Rossland Ore Shipments.....                                                                        | 214-237            |                                                                                                 |                    |
| McDougall Furnace, Some notes on Roasting<br>with the.....                                             | 87                              | Royalty Tax, The, B.C.....                                                                         | 8                  |                                                                                                 |                    |
|                                                                                                        |                                 | Royal Commission, The British re Coal.....                                                         | 189                |                                                                                                 |                    |
|                                                                                                        |                                 | Royal Commission, The Treadgold.....                                                               | 165-203            |                                                                                                 |                    |
|                                                                                                        |                                 | Russia, Asbestos Mining in Asiatic.....                                                            | 110                |                                                                                                 |                    |
|                                                                                                        |                                 | Rutherford, The late J. George, M.E.....                                                           | 45                 |                                                                                                 |                    |



# CANADIAN MINING INSTITUTE



## ANNUAL MEETINGS

The Annual General Meetings of the members of the Canadian Mining Institute for the transaction of business, the discussion of papers, etc., will be held in the

**KING EDWARD HOTEL, TORONTO**

ON

**WEDNESDAY, THURSDAY and FRIDAY**

..... 2nd, 3rd and 4th MARCH, 1904 .....

### SINGLE FARE ON RAILWAYS.

BY special arrangement members will be carried to Toronto and returned for a SINGLE FARE on the Canadian Pacific, Grand Trunk, Intercolonial, Quebec Central, and Canada Atlantic Railways. In order to secure this rate members and mining men who purpose being present at the meetings must obtain from their Ticket Agent the ordinary form of Convention Certificate provided by railways. They will purchase a one-way trip ticket to Toronto and on presentation of Certificate duly vized by the undersigned will be returned free of charge.

### INSTITUTE GOLD MEDAL.

The Council of the Institute will award a Gold Medal for the best paper contributed by members to the Transactions of the Institute during the year 1904.

### STUDENTS' PRIZES.

In addition to the President's Gold Medal the Council offers three prizes of a cash value of twenty-five dollars each for the best papers contributed by Canadian mining students on the following subjects :—

- GROUP I.—ORE DEPOSITS AND MINING GEOLOGY—The subject may be treated generally, or some particular district or single deposit may be discussed or described.
- GROUP II.—MINING PRACTICE—Any and every branch of mining may be treated such as pumping, hoisting, ventilation, timbering, ore extraction, development, etc., etc., or some particular method of mining, or some individual mine or group of mines, may be described or discussed.
- GROUP III.—ORE DRESSING AND METALLURGY—Any branch of ore dressing or metallurgy may be treated as for example—crushing, jigging, milling, concentrating, smelting, roasting, cyaniding, etc., or some particular plant may be described or discussed.

Competitors must advise the titles of their subjects to the Secretary of the Institute not later than the 18th February next and MSS. must be sent to him on or before the opening session of the meeting on 2nd March.

### SYLLABUS OF PAPERS.

Syllabus, embracing over forty papers, and detailed programme of arrangements for these meetings will be mailed to members in due course.

**EUGENE COSTE,**  
PRESIDENT.

**B. T. A. BELL,**  
SECRETARY.



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

**ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.**

THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

**CHROME STEEL WORKS,**  
BROOKLYN, N.Y., U.S.A.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.



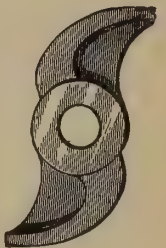
**THOS. FIRTH & SONS, Ltd., Sheffield,**  
**Tool Steel and Rock Drill Steel**  
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL SHELLS, CRUSHER PLATES.



**H. W. DeCOURTENAY & CO.**

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

**THE LUNKENHEIMER**  
**"DURO" BLOW-OFF VALVE.**

A VALVE with self-cleansing seat, simple and practical in construction and entirely different from all other blow-off valves in the market.

The way the "Duro" is built, no scale or sediment can lodge on the seat. If you want a practical success and a Valve that will last as long as the boiler, you want the "Duro." No boiler should be without one.

Made in screw ends, flange ends, and screw and flange ends.



Made in 2, 2½ and 3 inch sizes. Every Valve tested, inspected and warranted to give complete satisfaction. Specify the "Duro" and order one from your dealer.

Write for Catalog of brass and iron steam specialties and engineering appliances of superior quality.

**The Lunkenhelmer Company**  
SOLE MAKERS  
Cincinnati, Ohio, U. S. A.

BRANCHES NEW YORK: 20 Cortlandt St.  
LONDON: 35 Great Dover St.

**Canada Atlantic Ry.**  
THE SHORT FAVORITE ROUTE  
BETWEEN

**Ottawa and Montreal.**

**8 TRAINS DAILY 8**  
EXCEPT SUNDAY

And Sunday Train Both Directions

PULLMAN BUFFET PARLOR CARS  
Close Connections at Montreal with Trains for

**Quebec, Halifax, Portland**

And all Points EAST and SOUTH.  
FAST THROUGH SERVICE BETWEEN

**Ottawa, New York and Boston**

And all NEW ENGLAND POINTS

Through Buffet Wagner Sleepers between Ottawa and New York  
Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

**E. J. CHAMBERLIN,** General Manager.  
**J. E. WALSH,** Ass. Gen. Passenger Agt.  
**C. J. SMITH,** Gen. Traffic Manager.



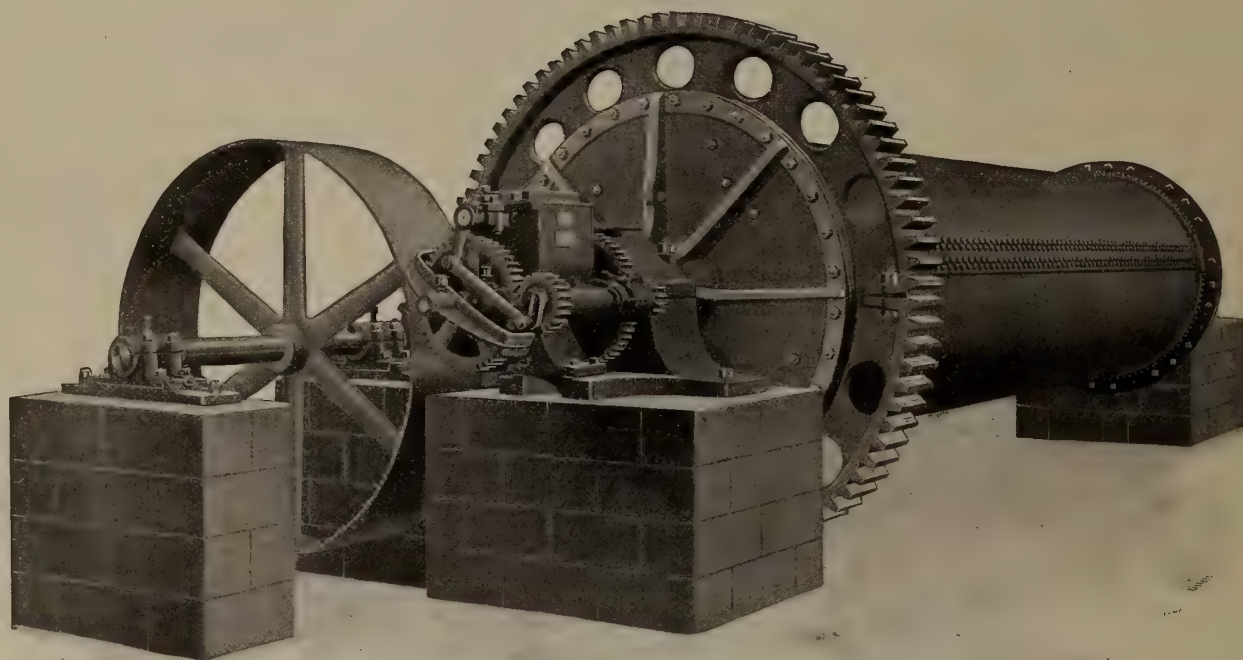
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO. FRASER & CHALMERS. GATES IRON WORKS. DICKSON MFG. CO.  
 Milwaukee, Wis. Chicago, Ill. Chicago, Ill. Scranton, Pa.

MANUFACTURERS OF

## Mining Machinery



### GATES' TUBE MILL

This cut illustrates the highest type of all modern fine pulverizers, namely, the Gates Tube Mill. As a tube mill it is essentially a fine pulverizer and when used as such is effective and economical, giving large capacity at a very low cost for repairs. The Tube Mill consists of a plate steel shell, made to revolve by means of heavy gearing at about 25 revolutions per minute. The shell is about half filled with hard flint pebbles and material to be pulverized, and the constant rotation and wave-like tumbling action of the pebbles produces an enormous and flexible grinding surface. It is continuous in its operation, being equipped with the Gates Patent Automatic Adjustable Feeder and most approved form of dustless discharge. As the fineness of the discharged product depends upon the quantity of material fed, we have taken special pains to produce an automatic feeder, driven from the mill itself, capable of being adjusted to a nicety, which is not found in any other tube mill. In a modified form this same type of mill can be used for wet pulverizing, and we have furnished a number of the smaller sizes for regrinding jig tailings.

We have patterns for and are prepared to manufacture mills 36, 42, 54 and 60 inches in diameter, and of any practicable length for the respective diameters.

#### BRANCH OFFICES:

NEW YORK. Broad Exchange Bldg.  
 PITTSBURG, 1212 Frick Bldg.  
 MINNEAPOLIS, 410 Corn Exchange Bldg.  
 DENVER. 1649 Tremont St.

#### GENERAL

CHICAGO.



#### OFFICE:

ILL., U.S.A.

HOME INSURANCE BUILDING.

#### BRANCH OFFICES:

SALT LAKE CITY. Dooly Block.  
 SPOKANE. 512 First Ave.  
 SAN FRANCISCO. 623 Hayward Bldg.  
 LONDON. ENG. 160 Dashwood House



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO. FRASER & CHALMERS. GATES IRON WORKS. DICKSON MFG. CO.  
Milwaukee, Wis. Chicago, Ill. Chicago, Ill. Scranton, Pa.

BUILDERS OF HIGH GRADE

## MINING MACHINERY

### The Lamb Automatic Tailings Sampler



**EVERY UP-TO-DATE  
MILL SHOULD HAVE  
THIS SAMPLER**

**Do you keep a check on  
what your Mill is doing?**

**How high is the percentage  
of saving or extraction  
of values?**

**How much is carried off in  
the Tailings?**

If you are not watching these points you should do so. The simplest and best method is by the use of the Lamb Sampler. Very simple, automatic and perfectly accurate, absolutely Reliable, requires no attention and can be put under lock and key to prevent any interference with the samples.

**WRITE FOR FULL  
DESCRIPTION**

The Lamb Automatic Tailings Sampler

#### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
PITTSBURG, 305 Gas. Nat. Bank Bldg.  
MINNEAPOLIS, 418 Corn Exchange Bldg.  
DENVER, 1649 Tremont St.  
SALT LAKE CITY, Dooly Block.

#### GENERAL OFFICE:

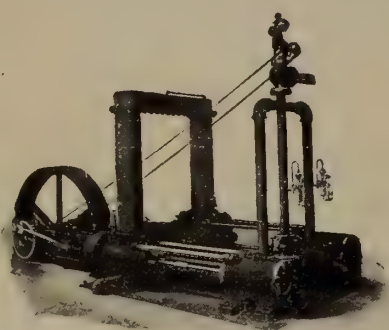
**CHICAGO, ILL., U.S.A.**

HOME INSURANCE BUILDING.

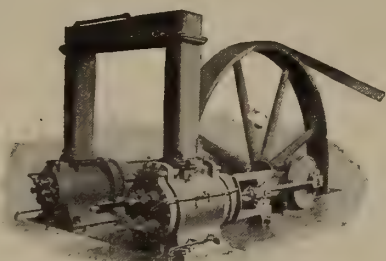
#### BRANCH OFFICES:

SPOKANE, 512 First Ave.  
SAN FRANCISCO, 137 Montgomery St.  
CITY OF MEXICO, 8 Calle Gante.  
LONDON, ENG., 160 Dashwood House.

# THE CANADIAN RAND DRILL CO



Class B-D Compressor  
[Air Cylinders next to Frame]



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Duplex (Meyer-Valve) Compressor



Straight Line Belt Driven Compressor



Cross-Compound Corliss Compressor

**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE



**The Popular Fuse Throughout the Dominion**

SOLE MANUFACTURERS

**WM. BENNETT SONS & Co.**

ROSKEAR SAFETY FUSE WORKS

**Camborne, Cornwall, England.**

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :-

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

**THE HAMILTON BRASS  
MFG. CO., Limited.**

HAMILTON. ONT.

# INGERSOLL-SERGEANT

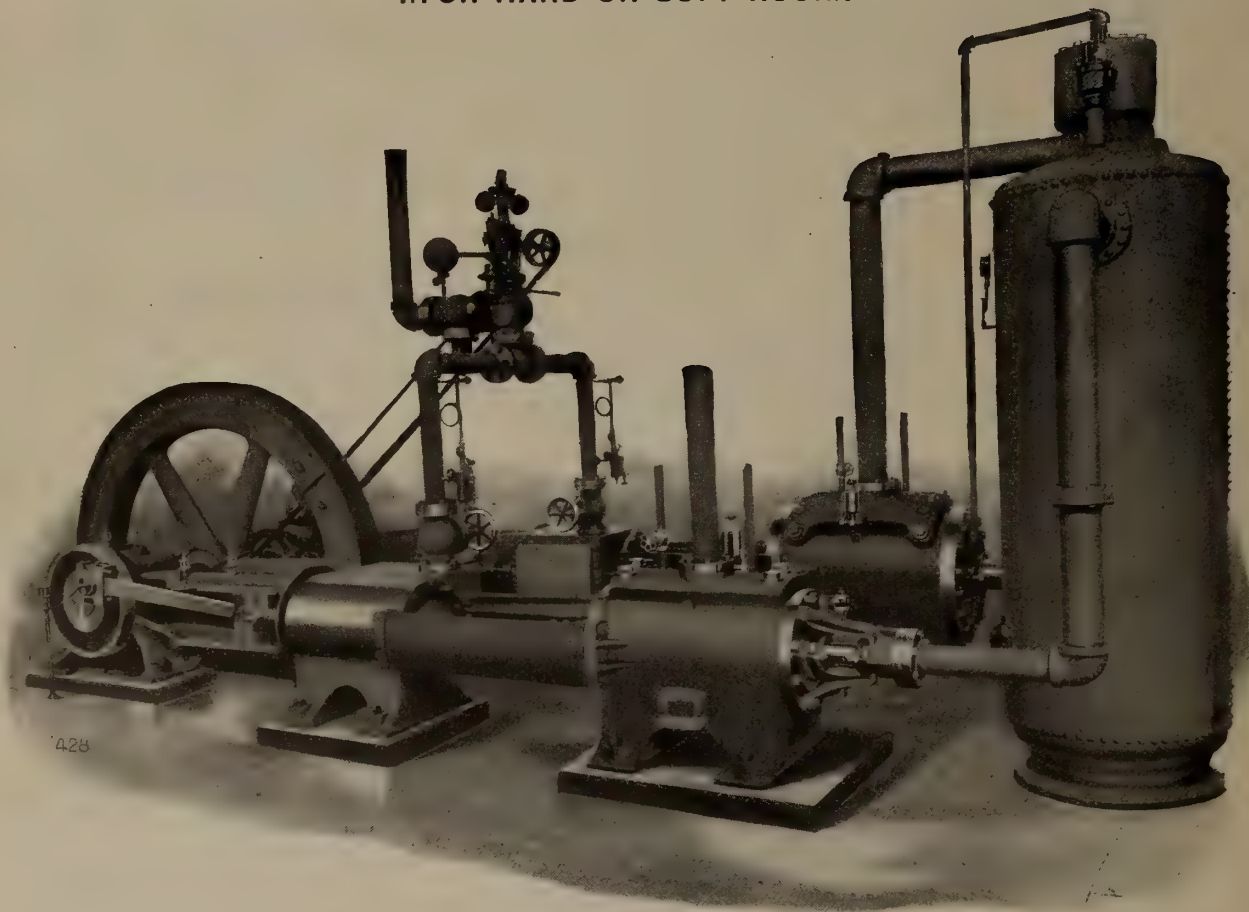
## AIR COMPRESSORS

...SIMPLE OR COMPOUND...

AND

## ROCK DRILLS

..FOR HARD OR SOFT ROCK..



DUPLEX STEAM ACTUATED COMPOUND AIR COMPRESSOR, CLASS G  
With Compound Double Acting Air Cylinder and Receiver Intercooler.

COMPLETE MINING AND QUARRYING PLANTS.

**JAMES COOPER MAN'F'G CO. LIMITED**  
**MONTREAL.**

BRANCHES—124 Hollis St., Halifax, N.S.

c/o Diamond Drill Co., Rat Portage, Ont.

P.O. Building, Rossland, B.C.

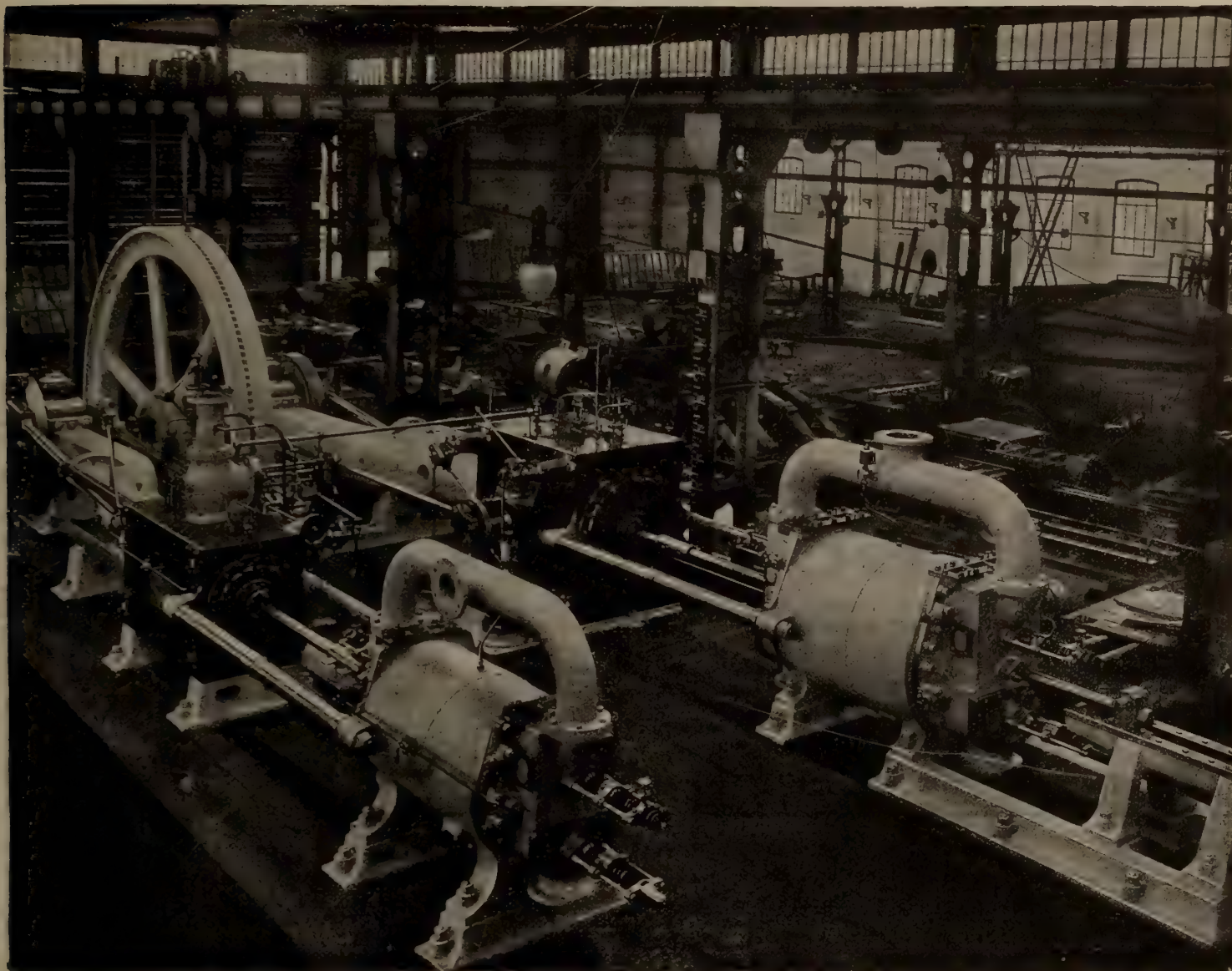


# WALKER BROTHERS

## WIGAN, ENGLAND

# AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully.

(Signed) pro S. PEARSON & SON,

E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons

## Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

# MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices

LONDONNEW YORKPARIS

## J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

(BLACK DIAMONDS)

AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

# STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{2}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASGOW, N.S.

# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# SULLIVAN

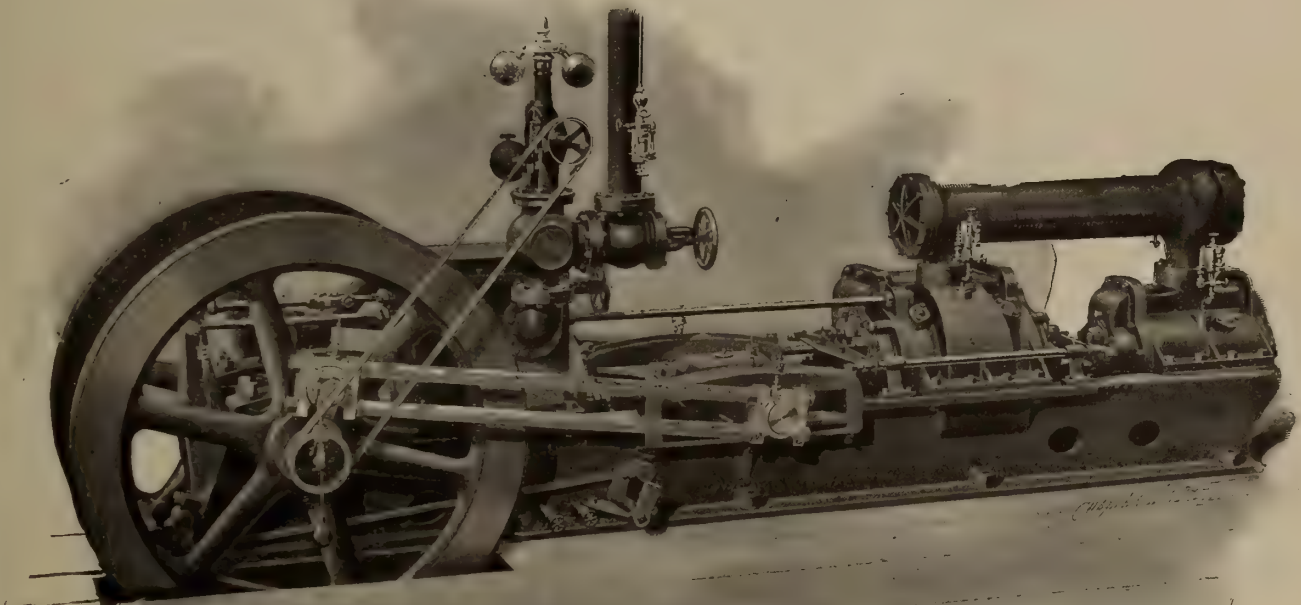
## Air Compressors

DURABLE

EFFICIENT

ECONOMICAL

COMPLETE LINE  
FOR ANY SERVICE



Sullivan Straight Line Compressor, Class W.B.

DIAMOND DRILLS  
Rock Drills  
Hoisting Engines  
Coal Mining Machinery

CONTRACTORS  
FOR  
DIAMOND DRILL  
PROSPECTING

To insure Prompt Attention,  
address Dep't 7.

# MACHINERY CO.

NEW YORK  
PITTSBURG

135 Adams Street, CHICAGO  
U. S. A.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.

# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the . . .

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,  
 President.

CHARLES FERGIE,  
 Vice-Pres. & General Manager.

D. FORBES ANGUS,  
 Secretary-Treasurer.



# ..COAL..

## DOMINION COAL COMPANY, LIMITED

Glace Bay, C.B. Canada

### MINERS OF

#### BITUMINOUS COALS

The celebrated "Reserve"  
coal for Household use.

#### "INTERNATIONAL" GAS COAL

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention. By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.

**C. SHIELDS, 2nd Vice-President and General Manager.**





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

COAL CUTTERS

Power Drills

Screens

Crushers

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.

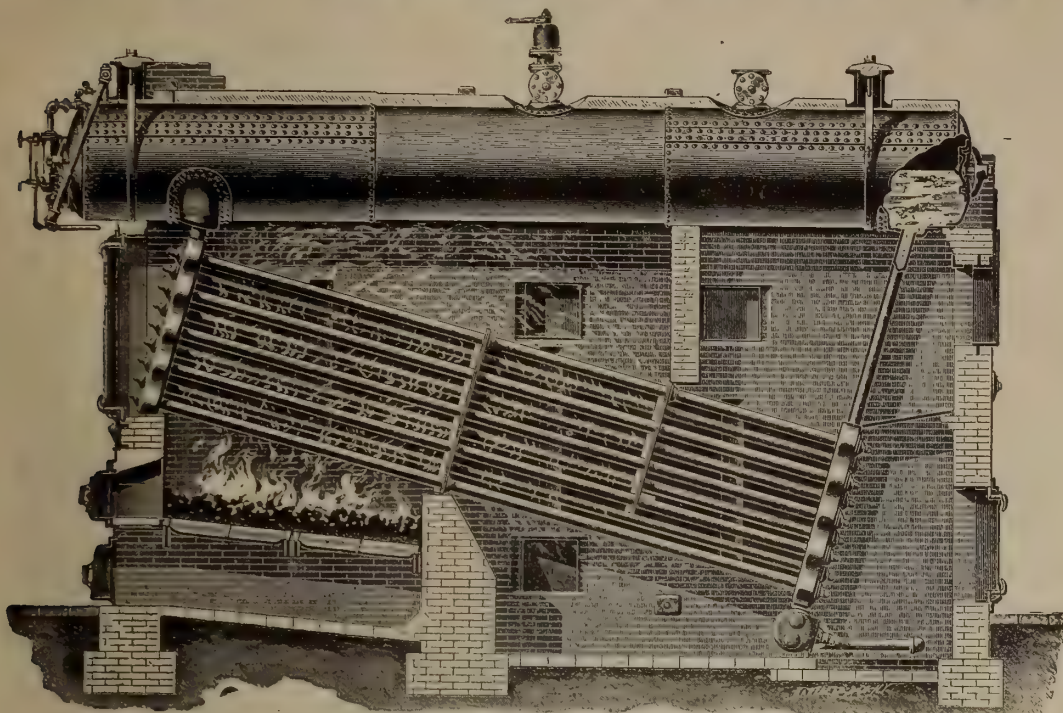


NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company



# Electric Blasting Apparatus.



Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.



MANUFACTURED ONLY BY

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

SEND FOR CATALOGUE

# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

# WIRE ROPE

**"WHITECROSS" Best English Rope**

Plough Steel and Other Grades.

Imported Promptly at Lowest Prices.

**A. C. LESLIE & CO., Canadian Agents, Montreal.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and Lachine Locks, P.Q.

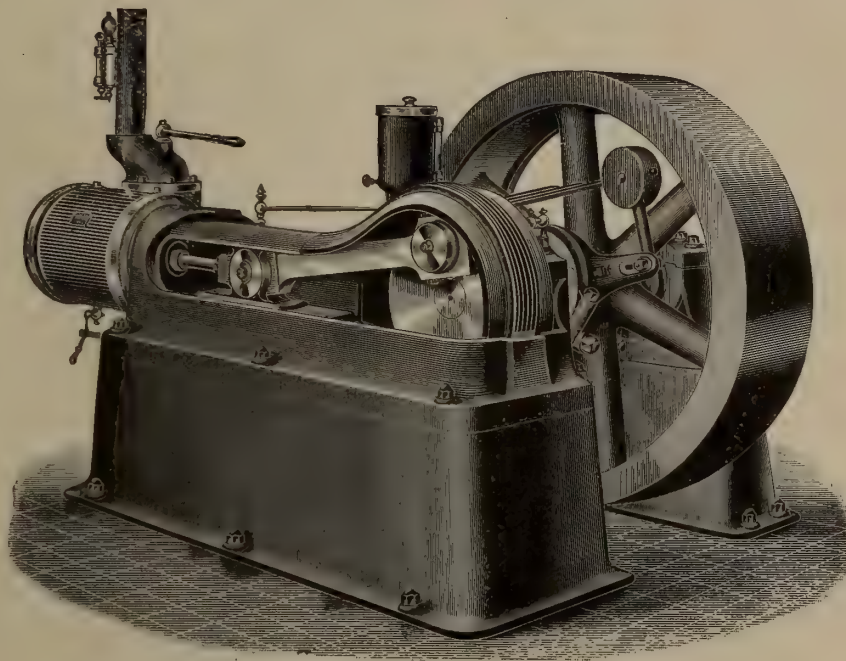
# MILL AND MINING MACHINERY

Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works.. **OTTAWA**



# Saved \$25 per Month.



**A customer says :—**

“ We find the 100 horse power engine bought from you very satisfactory. The saving in fuel is about \$25 per month over the engine we were running before.”

---

## Robb Engineering Co. Ltd.

AMHERST, N.S.

Agents { WILLIAM McKAY, 19 McKenzie Crescent, Toronto.  
WATSON JACK & CO., 7 St. Helen St., Montreal.



THE  
Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

Great Mining  
Regions

OF

British Columbia, the  
Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

SCHOOL of MINING

Practical Science Faculty of  
Queen's University

Kingston, Ontario.

THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN  
GROUP I.
  - (a) Mining Engineering.
  - (b) Chemistry and Mineralogy.
  - (c) Mineralogy and Geology.
  - (d) Chemical Engineering.
 GROUP II.
  - (e) Civil Engineering.
  - (f) Mechanical Engineering.
  - (g) Electrical Engineering.
 GROUP III.
  - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
October 1st, 1902.

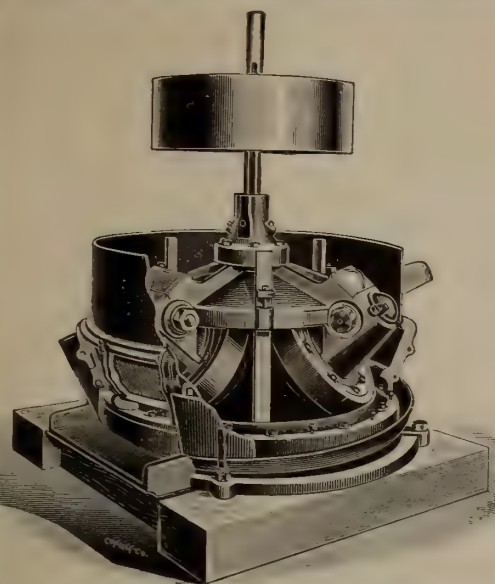
MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

*Send for free illustrated and descriptive catalogue to*

**Bradley Pulverizer Co.** BOSTON, MASS.

# RAILS

NEW AND SECOND HAND  
FOR RAILWAYS, TRAMWAYS, &c.

FOR SALE 56 lb. STEEL RE-LAYING RAILS IN CANADA, in Excellent Condition, with Fastenings, Rails Ready for Shipment. Also Locomotives, Steam Shovels, and other Railway Equipments.

For prices and particulars, also our new Catalog, write :—

**M. MITSHKUN CO.**  
DETROIT, MICH.

WEBBER PATENT

## COMPRESSION

## GRIP

with Patent Automatic Attacher

Used only on the  
Patent

## Bleichert Wire Rope Tramway

SUPERIOR TO ALL OTHERS.

## THE TRENTON IRON CO.

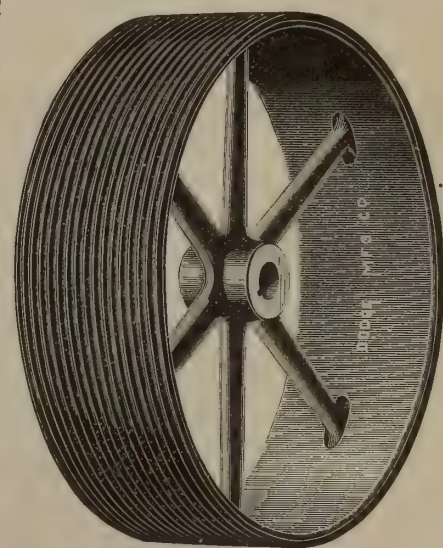
TRENTON, N. J.

Manufacturers, Engineers and Contractors, and sole licensees in North America for the Bleichert System. Also, Wire Rope Equipments for Cable Hoist-Conveyors, Surface and Underground Haulage, Transmission of Power, etc.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## Iron Grooved Wheels



## Dodge M'f'g. Co.

TORONTO  
CANADA



No lugs or knots of any kind required on the traction rope, giving longer service, and saving in repairs.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

**RICE LEWIS & SON**  
 LIMITED  
 HARDWARE TORONTO

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

### STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.

For  
 Miners  
 Pit Sinkers

## DYNAMITE AND EXPLOSIVES

For  
 Quarrymen  
 Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
 President.  
 C. A. MACPHERSON,  
 Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
**LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.**

Telegraphic Address:  
LOBNITZ, RENFREW A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

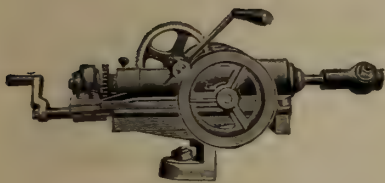
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers

**WILL WORK IN ANY POSITION, IN ANY ROCK.**

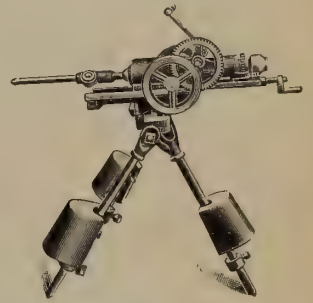
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



**H. D. CRIPPEN** SOLE MANUFACTURER **52 Broadway, New York**

## The Colorado Iron Works Co.

DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.**  
**DENVER, Colo.**



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address : - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

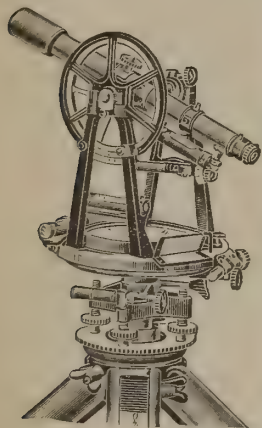
15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.



### G. L. BERGER & SONS

9 Province Court,  
BOSTON, Mass.  
SUCCESSORS TO  
BUFF & BERGER.

SPECIALTIES:  
Standard Instruments  
and Appliances  
for Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work.

SEND FOR CATALOGUE.

## McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES :

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address : CLAPHER, TORONTO.

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## ORFORD COPPER CO.

74 BROADWAY, NEW YORK.

### Copper and Nickel Smelters

WORKS AT CONSTABLE'S HOOK, N. J.

Opp. New Brighton, Staten Island.

Copper Ore, Mattes, or Bullion Purchased. Advances  
made on Consignments for Refining and Sale.

Specialty made of Silver-bearing Ores and Mattes—  
Copper Ingots, Wire Bars and Cakes—Ferro-Nickel  
and Ferro-Nickel Oxides for use in preparing Nickel  
Steel for Armour Plates.

### NICKEL AND NICKEL OXIDES.

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reserva-  
tions covering nearly a quarter of a million acres in  
Eastern Ontario, and principally within the belts con-  
taining Iron, Phosphate, Gold, Galena, Plumbago,  
Mica, Marble, Building Stone, and other valuable  
minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,

Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

### POGSON, PELOUBET & CO.

PUBLIC ACCOUNTANTS

|           |       |                    |
|-----------|-------|--------------------|
| NEW YORK  | - - - | 20 Broad Street    |
| CHICAGO   | - - - | Marquette Building |
| ST. LOUIS | - - - | Chemical Building  |
| BUTTE     | - - - | Hennessey Building |

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.  
1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty :

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON . . . YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street MONTREAL

**ASSAYS OF ORES**ANALYSES of all materials made with greatest accuracy.  
SAMPLES BY MAIL—1 cent 1 or 4 ozs.; limit 24 ozs.  
INSTRUCTION IN ASSAYING, Etc., to Prospect-  
ors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE . . . ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEERNo. 45 Broadway NEW YORK  
Office, Room 83.**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining Surveyors and  
Engineers. Valuers.8-KING STREET-8  
MANCHESTER, ENGLAND.**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. Gwillim, B.Sc.**MINING  
ENGINEER

KINGSTON . . . B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE . . . ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

879 DORCHESTER STREET, MONTREAL

CANADA.



## The Overstrom Diagonal Concentrating Table



This table is noted for the following features which will be of interest to Canadian millmen.

|                   |                            |                        |
|-------------------|----------------------------|------------------------|
| Less Floor Space. | Saving of Water.           | Fewer Parts.           |
| Long Feed Box.    | No vacant spaces on Table. | No Middlings Elevator. |

We are the sole Canadian manufacturers of this machine. Catalogue and prices promptly submitted.

81 York Street  
TORONTO.

ROSSLAND and  
GREENWOOD, B.C.

### THE JENCKES MACHINE CO.

27 LANSDOWNE ST.

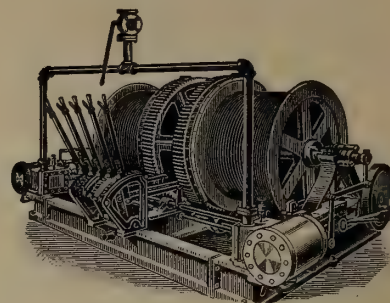
SHERBROOKE, Que., CANADA.

18 Victoria Sq.  
MONTREAL.

194 1/2 Hollis St.  
HALIFAX, N. S.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS. Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# WIRE ROPE

"ACME" brand extra tensile strength for heavy work.

Should only be used on special large wheels and drums.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

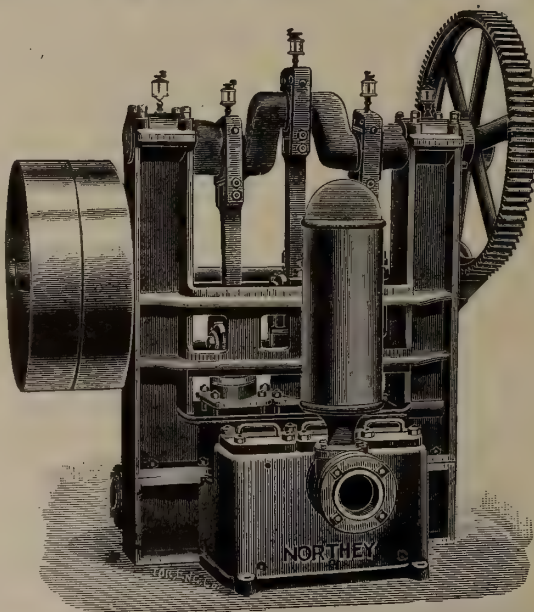
MONTREAL, QUE.

## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.




We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**THE NORTHEY CO.,**

Limited, Toronto, Ont.





# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN  
THE DOMINION OF CANADA.

**B. T. A. BELL**, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 1.

JANUARY, 1903.

VOL. XXII., No. 1.

## The Year in Ontario.

While the year 1902 has not seen any sensational developments in the mining industry of Ontario, there has been a large output of both metallic and non-metallic substances, and when the statistics for the twelve months are made up it will probably be found that notwithstanding checks sustained in the production of some important materials, the aggregate output both in quantity and value will show a substantial advance on the previous year.

Events during the past few years have demonstrated that in metalliferous mining the principal mainstays of the industry are iron, nickel and copper. In these articles of prime importance there has been and continues to be steady expansion alike in yield and productive territory. New mines are being opened up, old ones worked more extensively, and processes of treatment are carrying the ores more nearly to the stage of actual refinement than before. The yield of precious metals has not increased during the year, but indications of improvement are discernible.

The output of iron ore was the largest yet reached in Ontario, amounting to about 375,000 tons, about 100,000 tons more than in than in 1901. The bulk of this came from the Helen mine in Michipicoten, owned by the Lake Superior Power Company. The ore is a fair grade of hematite averaging about 55 per cent. iron, and working well in the furnace, but not up to Bessemer quality. The mines of Hastings county and other parts of eastern Ontario, which are on a much smaller scale, contributed about 20,000 tons to the total. Great activity has been shown in exploring for iron ores in the northern and north-western parts of the Province. Near Steep Rock Lake on the Canadian Northern persistent search is being made by the diamond drill for deposits of hematite, the presence of which is strongly inferred from surface and geological indications, and on the line of the Port Arthur, Duluth and Western Railway the extension into Ontario of the Mesabi range is being carefully examined for bodies of ore. In the township of Hutton, north of Lake Wahnapiatā, a body of magnetite has been located on an outcrop of the banded formation occurring so abundantly in northern Ontario. The find is regarded as an important one, concentration having formed a deposit of large size and of fair quality, though the ore is silicious and not of high metallic content. At present the region is without railway facilities.

The smelting of iron ore into pig iron is now a well-established industry in Ontario, and the furnaces at Hamilton, Deseronto and Midland were in full blast throughout the year, except when temporarily interrupted for repairs or by the difficulty of obtaining coke. The output of pig iron will be about the same as in 1901 when it was

116,730 tons. Steel by the open-hearth process has been made at the Hamilton blast furnace for two years or more, and during the past season the steel-making plant there has been doubled in capacity. The Lake Superior Power Company's Bessemer steel mill at Sault Ste. Marie began making rails last spring, and has rolled a large tonnage. Developments have shown that Mr. Clergue finds it difficult to compete with foreign-made rails, the existing tariff affording insufficient protection to the domestic article. The blast furnaces at Sault Ste. Marie, four in number, are not yet completed.

The transfer of the Canadian Copper Company's mines and works to the International Nickel Company, formed to control the nickel business in America, was followed by the stoppage of part of the plant and a lessened rate of production for some months of the year. Operations have since been resumed on the old scale. The low-grade mattes produced by this company are concentrated by the Ontario Smelting Works, and the nickel and copper contents raised to 70 or 80 per cent. The Mond Nickel Company at Victoria Mines has been steadily at work throughout the year, the product being a Bessemerized matte containing about 80 per cent. metal in equal proportions of nickel and copper, and the Lake Superior Power Company's smelters at the Gertrude mine, where is also treated ore from the Elsie, have turned out a considerable quantity of low-grade matte. Both the Mond and Lake Superior Companies are outside of the trust. The total output of nickel and copper contained in the mattes of the Sudbury district will probably exceed that of 1901, when it was 4,441 tons of nickel and 4,537 tons of copper, including the copper from the mines on the north shore of Lake Huron. Much prospecting for underground bodies of nickeliferous pyrrhotite by magnetic instruments was done in the Sudbury region during the past season, chiefly on behalf of Mr. Edison, the famous inventor. A large number of locations have been made, and it is the intention to test some of them by the diamond drill next Spring. The process depends upon the magnetic properties of pyrrhotite, but its utility remains to be demonstrated.

The copper district lying west of the nickel region is making progress. One mine, the Rock Lake, has reached the point of shipping concentrates. The Massey and others are in the development stage.

The yield of gold and silver will not exceed that of 1901. Most of the older mines in northwestern Ontario have suspended operations, temporarily at least, including the Sultana, Mikado and Black Eagle, formerly the Regina. Their places have been taken by the Big Master, Elizabeth, Twentieth Century and others, but the production of the latter group has not yet been large. In Eastern Ontario the Belmont mine, which is maintaining its reputation for efficient and skilful management, has been organized as a separate company, and it is proposed



to add another 30 stamps, making 60 stamps in all. The output of the silver mines of the Port Arthur district will be about the same as in 1901.

The metalliferous output of the Province for 1902 will be approximately as follows:—

| PRODUCT.        | QUANTITY. | VALUE.      |
|-----------------|-----------|-------------|
| Gold.....ounces | 12,500    | \$212,500   |
| Silver....."    | 100,000   | 50,000      |
| Copper.....tons | 4,550     | 637,000     |
| Nickel....."    | 5,000     | 2,000,000   |
| Iron ore....."  | 380,000   | 550,000     |
| Zinc ore....."  | 950       | 8,000       |
| Pig iron....."  | 115,000   | 1,650,000   |
|                 |           | \$5,107,500 |

NOTE.—The ton used is the statutory ton of 2,000 lbs.

Non-metallic minerals, in which Ontario is peculiarly rich, have well maintained their output. The great salt beds of the southwestern peninsula, which are capable of almost illimitable production, have been drawn upon for the quantity required to supply the home market. The yield for petroleum has for some years been slowly declining, but towards the close of the year what gives promise of being a new field has been opened up in the township of Raleigh in the county of Kent, where several productive wells have been sunk, one of them being a "gusher" yielding at first about 600 barrels per day.

The flow of natural gas has been decreasing of recent years, export from the Essex field to Detroit having been suspended a year ago by the Ontario Government. The Welland field is still producing a considerable quantity of gas, most of which is piped across the boundary to Buffalo. The reservoir which was struck in the Trenton rocks of the northern part of Bruce county has not been largely exploited during the past year.

The corundum deposits of Renfrew and Hastings are being worked by the Canada Corundum Company and the Ontario Corundum Company. The former is producing grain corundum of high quality in all the required sizes, while the latter is exporting the cobbled rock to the States for treatment.

The Canadian Goldfields at Deloro are still turning out large quantities of white arsenic, and the Atlas Arsenic Works adjoining are preparing to produce the same article. The projected combination which was to control the arsenic business in Ontario has fallen through, and there seems to have been a hitch in the arrangements for procuring a bounty on the product from the Governments of the Dominion and Province.

Other products such as mica, graphite, talc, gypsum and felspar have been mined on about the usual scale. There has been a good demand for iron pyrites, and more of this mineral was raised than in 1901.

Production of materials for construction has been going on apace. Brick, stone and lime are in demand, for building has been brisk. These articles account for a very large proportion of the value of the non-metallic production in Ontario. Other clay products, such as pottery, drain tile, etc., have been manufactured in the usual quantities. The Portland cement industry has been making great strides. In 1901 the output, which was the largest up to that time, was 350,660 barrels, the output of four factories. Last year eight factories were in operation and the production was materially increased. The county of Grey is the present headquarters of the cement industry, there being four factories in and about Owen Sound, and one—the largest in Canada—at Durham. Natural rock or hydraulic cement is also made at four establishments. The increase in the consumption of cement has been extraordinary, and it seems likely that this article will displace iron and wood for a large variety of uses.

Including metallic and non-metallic substances, the mineral production of Ontario in 1902 will be little if at all short of \$12,000,000.

## Mining in Nova Scotia During the Year 1902.

As heretofore, coal mining has occupied the principal position. A general increase has been shown, all the mining districts effecting larger sales than during the previous year. The total production was about 4,500,000 tons. The largest item of increase was in the consumption by the Dominion Iron and Steel Company, which may now be said to be in full blast, as far as the production of pig iron billets, etc. It is proposed to complete the rail mill to meet home requirements and to make structural forms. The scarcity of coal in the United States has called for about 100,000 tons of coal in addition to the regular requirements of the gas works at Boston. Shipments to New Brunswick, Prince Edward Island, and Newfoundland remained practically unchanged. Some 50,000 tons were shipped to European ports, but the growth of this trade is necessarily slow.

The operations of the Dominion Coal Company have continued to expand and the utmost efforts of the managers are taxed to keep development work ahead of the regular mining requirements. The collieries have been maintained in a high state of efficiency, and additions have been made to their equipment. The skill with which these efforts have been directed may be realized from the fact that the Reserve mine, at one time pronounced on its last legs, last year produced over 800,000 tons. Their big Dominion No. 2 Colliery will shortly be in a position to redeem the promise of being the largest single coal producing shaft in the world. The following comparative statement shewing the output of the collieries operated by this large enterprise during 1901 and 1902 will be of interest:—

| Colliery.             | 1901.     | 1902.          |
|-----------------------|-----------|----------------|
| Dominion No. I.....   | 641,543   | 697,241        |
| Dominion No. II.....  | 23,635    | 377,340        |
| Dominion No. III..... | 308,964   | 397,533        |
| Dominion No. IV.....  | 8,341     | .....          |
| Caledonia.....        | 640,688   | 689,232        |
| Reserve.....          | 730,378   | 801,945        |
| International.....    | 208,234   | 210,876        |
| Totals.....           | 2,561,783 | 3,174,227 tons |

or a gain over the previous year amounting to 612,444 tons.

The Nova Scotia Steel and Coal Company have turned their attention to a large extent of coal standing in pillars in the old workings, and are successfully mining them. They are pushing their two new mines, and expect next summer to reach an output of over half a million tons. Their new shipping facilities will permit of quick despatch. At New Campbellton and Port Morien a steady business has been carried on.

In Inverness County the Inverness & Richmond Collieries & Ry. Co.'s road has been put in full operation, and their mines at Broad Cove are producing regularly. The Port Hood Colliery has worked steadily during the summer. The Broad Cove coal is shipped at an excellent pier near Port Hastings, while the latter is shipped at a pier a few yards from the mine. At Mabou an American company has sunk slopes into the submarine coal and commenced systematic development work. A railway has been constructed from the mine about five miles to a shipping point in Mabou Harbor. It is proposed to continue this road to a junction with the Inverness Railway and Coal Company's line, and to continue thence by Lake Ainslie and Whycocomagh to Orangedale on the Intercolonial Railway. The output of the county was about 100,000 tons divided between Broad Cove and Port Hood. These mines should command a good share of the trade of the Gulf of St. Lawrence, and will ultimately save in the development of the iron, copper and lead ores of the northern section of Cape Breton.

In Pictou County the Marsh Colliery of the Nova Scotia Steel and Coal Company has been worked regularly, all its product going directly to the Steel Works at Trenton. The other mines have con-



tinued their regular outputs, and have contributed to the trade up the St. Lawrence now expanded to over a million and a quarter of tons. During the fall a large drill, purchased by the Government of Nova Scotia, has been started to prove the district lying between New Glasgow and Pictou. If the hope is realized that there exists in this section beds of coal, it will undoubtedly extend over many square miles in the Counties of Pictou, Colchester and Cumberland.

A comparison of the output and shipments of the Acadia Company with 1901 shows:—

|                  | 1901.   | 1902.   |
|------------------|---------|---------|
| Coal raised..... | 270,253 | 319,123 |
| Coal sold.....   | 230,567 | 278,838 |
| Coke made.....   | 11,738  | 7,411   |
| Coke sold.....   | 11,736  | 7,411   |

The returns from the adjoining company, the Intercolonial Company, also show an important increase, the returns by Provinces shewing disposals as follows:—

| To                      | 1901.   | 1902.         |
|-------------------------|---------|---------------|
| Nova Scotia.....        | 75,949  | 86,083        |
| New Brunswick.....      | 17,883  | 9,941         |
| P. E. Island.....       | 10,957  | 20,502        |
| Quebec.....             | 64,882  | 74,893        |
| Ontario.....            | .....   | 930           |
| Coke ovens.....         | 9,398   | 8,108         |
| Colliery employees..... | 3,615   | 4,018         |
| Colliery engines.....   | 15,270  | 15,762        |
| United States.....      | .....   | 430           |
| Total disposals.....    | 197,957 | 220,367 tons. |

The total raised at the Drummond collieries amounted to 216,180 tons and the shipments by rail and water 191,560 tons. The company also made 4,685 tons coke.

In Cumberland County the output of the Springhill mines was nearly 500,000 tons, a large shipment being made to United States ports. The explorations conducted by Mr. Fletcher of the Geological Survey having shown the western extension of the seams worked at Springhill, and boring operations are contemplated to prove their presence about six miles west of Springhill. Mining was continued at the Joggins, and at the small mines in the district extending from Macan to the River Hebert. The disposals of the Cumberland Railway and Coal Co. were:—

|                     |         |
|---------------------|---------|
| To Nova Scotia..... | 103,339 |
| New Brunswick.....  | 171,602 |
| Quebec.....         | 48,733  |
| United States.....  | 112,123 |

Or a total of 432,797 tons

compared with a total of 341,876 tons in 1901.

Iron mining has shown little progress in Nova Scotia, the total production being about 20,000 tons by the Nova Scotia Steel and Coal Company. Bell Island, Newfoundland, contributed nearly 500,000 tons to meet the wants of the Sydney and Ferrona furnaces, including a few cargoes of high-grade foreign ores. The Dominion Iron and Steel Company have practically completed their original plant, and are now increasing their oven plant. In all probability two more blast furnaces will shortly be added. The Nova Scotia Steel and Coal Company are steadily pushing the construction of their steel and iron plant at Sydney Mines. To meet the needs of the blast furnaces, etc., last year about 450,000 tons of coke were made for a production of about 220,000 tons of pig iron.

At the Londonderry Furnaces, Colchester County, a revival has taken place. This plant has passed into the hands of the Messrs. Drummond and other Montreal capitalists, who are engaged in putting the plant in order and in reopening the mines. When in operation these works will call for considerable amounts of fuel from Pictou and Springhill coal mines.

The extent of the Nictaux iron ore fields has been enlarged by

further prospecting, and it is reported that arrangements are completed for shipping ore from the Arisaig district to the Sydney furnaces.

The gold production of Nova Scotia continues lamentably small, being 29,000 ounces, compared with 31,000 ounces in 1901. The Richardson, Caribou, Sherbrook, Waverley, and Brookfield districts continued working steadily with satisfactory results. Other districts continued dull and few discoveries of promising veins have been reported.

The future of gold mining in this Province seems bound up in the development of its low-grade propositions. There is, however, a disinclination on the part of those locally interested in gold mining to incur the expense necessary to develop a low-grade property to such a point as will interest capitalists. Low-grade properties tested and developed to show large bodies of average values are readily saleable, but unless enough has been spent to warrant a purchaser to make the necessary large scale tests they will not be looked at.

The shipments of gypsum were about 180,000 tons, showing an increase over those of the preceding year. They were from the Windsor district, which by tugs and barges is in easy communication with United States ports via the Bay of Fundy.

The limestone quarries yielded as far as can be learned about 263,000 tons, the greater part coming from the deposits at St. George's River, Marble Mountain and Brookfield for the purposes of the blast furnaces. Small quantities of barytes, manganese, moulding sand, etc., were reported as having been extracted. The stone quarries and brick yards were kept employed steadily during the summer, but, it is to be regretted, there appears to be no way of arriving at the extent and value of their production.

#### Southern British Columbia in 1902.\*

The greater part of the mineral product of British Columbia continues to be derived from the southern part, and particularly the south-eastern part of the Province. In the north the output is entirely alluvial gold, as yet, and although the aggregate amount is important the writer is not particularly acquainted with these northern fields, and therefore makes only this passing reference to them. Atlin and Cariboo are the two important districts; from recent reports it would appear that the largest producing mines have not met with any pronounced success during the year.

In order to review briefly the industry of the southern portions of the Province, it may be well to consider the output according to its nature. The chief products of the year have been, as before: (a) silver-lead ores, (b) gold-copper ores, (c) gold milling ores, (d) coal and coke.

The silver-lead industry seems as though smitten by a plague. This is the result of very low prices and a distant market for its lead. Although we have the advantage of ample local smelting facilities, the fact that the Canadian market for lead is very limited, and that the American is not open to us, forces the bulk of our lead products to far-off and low-priced markets at great cost. Consequently, only those mines whose ore is rich in silver can continue to operate.

In East Kootenay, the St. Eugene, capable of an output of 3,000 tons of 65 per cent. lead concentrate monthly, has been idle throughout the year. The North Star has produced sparingly, and practically only enough to meet the expenses of development. The Paradise, the only mine in the Province having considerable amounts of carbonate of lead, is also low-grade in silver, and has shipped very little during the year. Here, again, development only is being done in hope of better times.

\* By S. S. Fowler, S.B., Nelson, in the *Engineering and Mining Journal*.



In the Slocan District of West Kootenay, famous for the high ratio of its silver to lead, the number of operating properties has continued about as in previous years, and the output of ore and concentrates will be about 26,000 tons, approximately the same as for 1901. It must be stated, however, that this figure is maintained by the considerable output of dry silver ores, and the actual tonnage of lead will probably be shown to be much less than that of the previous year, while both lead and silver will not bear comparison with the output of the banner years of 1897 and 1898. The chief producers of the year, as to tonnage, have been, Whitewater, Rambler-Cariboo, Payne, Enterprise, Arlington and Bosun, and these, with some 25 or 30 others, which have produced during 1902, are employing at the close of the year probably not over 400 men. Such are the straits in which all manner of adverse external conditions have placed a large number of excellent properties.

The only other silver-lead district is that of Lardeau, which has not yet reached a stage of large production, owing, until recently, to its inaccessibility. Like the Slocan, its lead ores are high-grade in silver, and it suffers from the same adverse circumstances. The chief mines are the Nettie L., Silver Cup and Triune.

A determined effort is now being made by the lead producers to secure such changes in the Canadian Customs tariff as will conserve the entire Canadian market for Canadian lead. Under the present tariff, and because of the absence of corroding works, it is possible for the refiner to dispose in Canada of only such lead as is used in the metallic form. This amounts to only 3,000 or 4,000 tons per annum. All lead mined in British Columbia is bought by the smelter according to the English price, and after deducting the costs of freight on the bullion and marketing charges, the miner now receives a miserable pittance—about \$1.35 per 100 lbs.—for his product.

The gold-copper districts continue to be Rossland and the Boundary region. Rossland in 1902 turned out approximately 350,000 tons (an increase of about 50,000 over 1901), all of which is smelted either at Trail, B.C., or Northport, Washington. The camp has been free from any labor disturbances, which so much interfered with its output in 1901; and in spite of some distrust as to the result of "manipulation" in the shares of some of its mines in London, it appears to have entered on a period of permanent, if moderate, prosperity and progress. Aside from the large amounts of high-grade material which go direct to the smelters, Rossland's mines hold much larger quantities of low-grade ores, which are doubtless amenable to a preliminary concentration, and much thought is now being directed to the dressing of these ores, with success in sight. The great bulk of the tonnage of the year has come from the Le Roi No. 1, Le Roi No. 2, Centre Star and War Eagle. No. 2 declared a dividend in May last, but No. 1, although it has published large operating profits for several months past, appears to have devoted its earnings to cancellation of debts.

The Boundary District continues to uncover astonishing bodies of very low-grade smelting ores. The ores are, and will be for a long time to come, won by quarrying, and, being self-fluxing, are cheaply smelted (in the ratio of about 25 tons of ore into 1 of matte), at three plants, all within a few miles of the mines. The tonnage smelted in each furnace daily runs from 350 to 425, and the resulting matte is converted (to blister copper) at one of the smelting plants. Thus, with the assistance of the most economical exploitation, these extremely low-grade ores are turned to profitable account. Although no new producers have been added to the list, the old ones have materially increased their output, and it is probable that there will have been nearly 500,000 tons smelted during 1902. Along with the other smelters of the Province, those of the Boundary suffered from shortage

of coke supplies, and one of them was handicapped severely by a lack of water-power. These retarding factors kept the tonnage much lower than it might have been, but during the coming year the tonnage will probably be largely increased, and the costs decreased, by the use of the power of the Kettle River, generated at Cascade, where the Cascade Water Power and Light Company, Limited, has recently completed the installation of an extensive electric equipment, with transmission lines to Phoenix, the center of the chief mines.

The important mines of the year are the Snowshoe, the B. C., Knob Hill and Old Ironsides, all near Phoenix; and the Mother Lode and Sunset, west of Greenwood. Beside these the Emma for several months past has been putting out daily over 100 tons of iron flux which is used by the smelters at Trail and Nelson.

The gold-milling ores of the Province are, apparently, not very abundant. They are found chiefly in the Nelson District, and the Ymir Mine continues to be the chief producer, having crushed about 50,000 tons of profitable ore during the year. At the Ymir mill about 60 per cent of the gold is amalgamable, although 7 per cent of concentrate is produced, carrying 20 per cent of lead, besides much zinc and iron sulphides. The Arlington, of Erie; the Willcox, of Ymir, and the Poorman, near Nelson, help to make a respectable total for the year. Another important mine of this class is the Cariboo, at Camp McKinney, Yale District, which has been a steady and profitable property for eight years or more. The free-milling ores at Fairview, Yale District, have not as yet proved of any importance, although it seems probable that one or two properties may yet turn out to be valuable.

A portion of the Lardeau District, a few miles from the head of Arrow Lake, West Kootenay, has been the scene of a good deal of activity in the development of free-milling quartz, of which there appears to be extensive bodies. Thus far, however, little has been accomplished in actual output.

The Similkameen River portion of Yale District is still without railway communication, and its several excellent copper-gold properties are therefore unable to produce.

On Vancouver Island several discoveries of copper pyrite of low-grade in gold, but comparatively high in copper, have been made, and they are developing favorably. On the east side of the island the Lenora and Tyee are important mines, and are now possessed of smelting facilities. The coming year will probably see a large production of copper from this district.

The coal measures of British Columbia are a source of much wealth to the Province. The mines of Vancouver Island continue, as they have for many years, to produce largely, mainly for export. The other producing mines are those of the Crow's Nest Pass Coal Company, in the southeastern corner of the Province. One of the company's mines suffered from a disastrous explosion in the early part of the year, and this was immediately followed by a prolonged strike of the employees. Agreement was finally reached in August, and, except during some minor labor disturbances, the several openings have since been outputting largely. The cessation of output seriously affected the operations of five smelters, and, through them, the whole community. Crow's Nest coke is exported in large quantity to Montana, and this demand, together with that of the local smelters, as well as the demand for coal for steam and other general fuel purposes, is causing a rapidly increasing yield from the mines. Now, putting aside the material phases of the mineral industry of Southern British Columbia during 1902, if we shut our ears to the noise of alarmists, on the one hand, and the boasting of optimists on the other, we shall perceive three dominant notes. First, we shall realize that the prospectors are feeling severely the effects of the check in the flow of mining capital to the Province, as indicated by the fact that few, if any, properties of im-



portance have been added to the list of mines during the year. Second we see that the mining community, forced to live on its income, has made a decided advance in the economies of production, which will be of benefit as long as the industry is permitted to exist. Thirdly, we observe that not only has nothing been done by the Government to improve the conditions under which mining is conducted, but during the last session of the legislature further responsibilities were placed on those who operate mines, with a resultant increasing tendency to keep back capital, and an increased risk to that already invested.

Although the returns which will be published by the Minister of Mines will probably show a fairly well maintained output, it is significant of the burdens which the industry has to bear that the published dividends of the year are pitifully small in proportion to the aggregate value of the output of metals. It is to be observed not only that our home markets for base metals are as far away as they well can be; and further, that the costs of labor and all supplies, except timber, are very great. If, therefore, the Province is to derive any permanent benefit from its bountiful mineral resources, the industry and the capital invested in it must be afforded every encouragement, and given every possible assistance, in its endeavor to sustain itself.

### Lead Refining at Trail, B.C.

As evidencing the fact that the lead industry in Canada is keeping pace with the present era of progressive prosperity, it is interesting to note that, for the first time in history, the Canadian manufacturers of lead products are using a raw material which has not only been mined in Canada, but has been smelted and refined in this country as well. That is, after the ore is smelted, the gold, silver and impurities in the resulting bullion are separated, leaving commercial pig lead 99.999 per cent. pure, and ready for the manufacturer to convert it into lead pipes, sheet lead, shot, white lead and materials of paint generally.

Canadian smelters have been dependent, heretofore, upon the American Smelting and Refining Trust, which not only regulated the production and price of lead, but practically stifled the British Columbia industry, by refusing to purchase our ores.

Canadian bullion was sold to United States refiners, who refined it in bond for export to foreign countries. But under the United States tariff, it is necessary for the refiner to export only 90 per cent. of the resulting pig lead. For this, however, he receives the London quotation of, say, \$50 per ton, although at this writing it is very much lower, while the remaining 10 per cent. he may retain free of duty and sell at the United States protected price of \$82.50 per ton. Then, also, he saves the express and marketing charges on the gold and silver values, which a Canadian refinery distant from commercial centres would have to pay. Thus, the United States refiner can market Canadian lead at \$53.25, saving also the expressage and marketing charges, while the Canadian refiner can realize only the London quotation on his own product. To partially offset this disadvantage, the Canadian Government has granted a bounty on lead refined in Canada, to the extent of \$5 per ton the first year, \$4 the second, \$3 the third, and so on, but it is readily apparent that such a bounty is inadequate to place a Canadian refinery at an equal advantage with one in the United States. However, the action of the Government has been instrumental in enabling Canadian capitalists to take the initiative in a method of refining, which will be a pronounced factor in the encouragement of lead mining.

When the Canadian Smelting Works, in the little city of Trail, British Columbia (which is the largest lead reduction plant in the Dominion), determined to erect a refinery, a totally new process of

separating the bullion contents was experimented with, and proved successful. It is styled the Betts Electrolytic process, and is the result of continued experiments on the part of Anson G. Betts, of Lansingburg, N.Y.

For many years experiments have been in progress, with the hope of eliminating the fire process in the separation of the values and impurities in lead bullion. This process is hard on those engaged in the work, and the dangerous lead fumes make it impossible for men to continue their vocation longer than three or four years, lead poisoning invariably resulting. German and American chemists endeavored to present a new method, but without success, until it became the prevalent opinion of electro-metallurgists that it was impossible to form solid lead by electrolysis. A spongy lead was the nearest approach, until Mr. Betts overcame all obstacles by his new process. As a result, the Trail refinery is producing the first electrolytic lead, on a commercial scale, in the world.

The Betts process involves the dissolution of the lead in the bullion, or anode, and its precipitation upon a steel plate, or cathode, by electrolysis. Electrolysis may be defined as the course of chemical changes induced by the passage of a current of electricity through a chemical compound, in solution. The solution, or electrolyte, with the aid of the current, dissolves the lead in the anode and transfers it to the steel plate, leaving the impurities behind as a slime.

The plant consists of 28 cedar vats, well joined, and lined with rubber composition. They are in four rows, seven to a row, and so placed that each vat is three inches lower than the one above, in order to permit of the better circulation of the solution. The current is furnished by two dynamos, running in parallel, generating 2,000 amperes each, and conveyed to the vats by means of large copper bars. The vats are connected in series, so that the current passes from the first on through the twenty-eight, entering the solution in each vat through the anode and passing out through the cathode. To make the matter clearer, it may be well to state that the electrode by which the current enters the electrolyte is called an anode, and in this case is the base bullion, and that by which it leaves the electrolyte is called a cathode, which in this case is the steel plate.

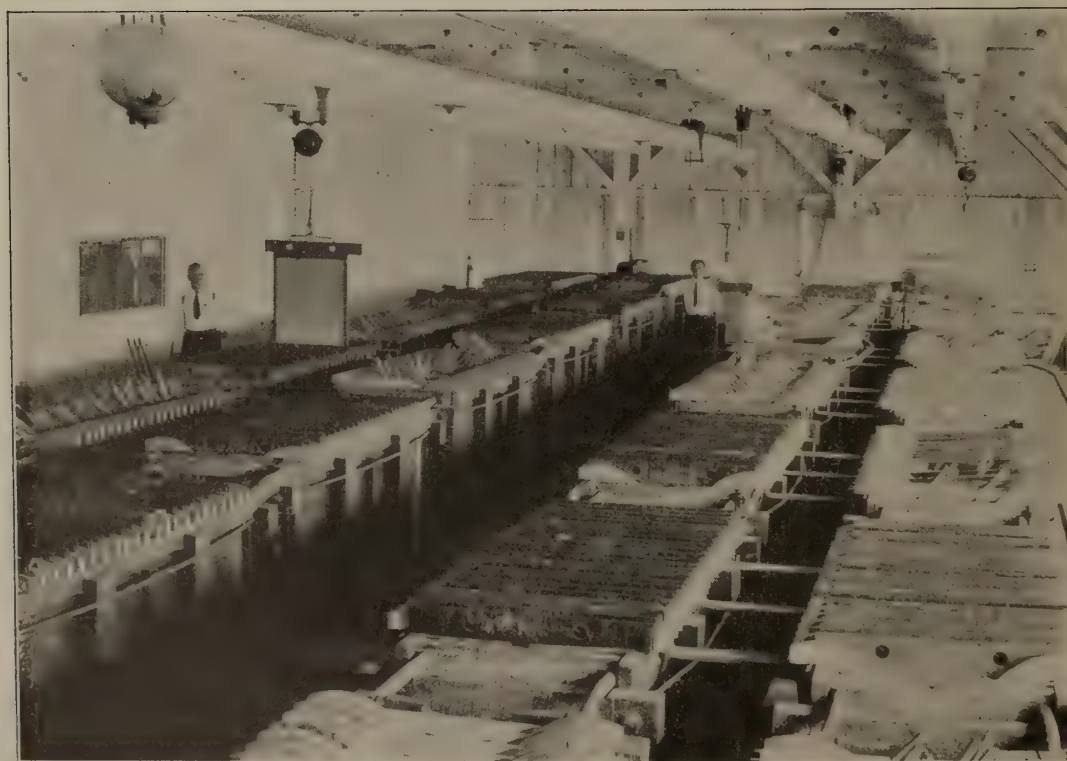
After the lead ore is treated at the smelter, the resulting bullion, instead of being cast into bars, as it runs from the furnace, is moulded into anodes, 30 x 40 inches, and an inch in thickness. It is made into this form in order to provide a larger surface for the action of the acid. These anodes weigh about 350 pounds, and contain, approximately, 3 per cent. of impurities, consisting of arsenic, antimony, iron, zinc, silver, gold, bismuth and cadmium. They are carried on a runway and lowered so as to hang perpendicularly in the electrolyte, which is a solution of lead salt. Twenty-two of these anodes are thus suspended, with a steel plate or cathode placed in like manner, between the anodes, at an equal distance of two inches. The selective action of the electrolyte dissolves the lead in the anode, and the current of electricity transfers it to the cathode, leaving the foreign substances in place on a mere skeleton or sheet of lead, which remains. The process by which the twenty-two anodes in each vat are dissolved requires about eight days, and in order that the action may be equal on the entire surface of each anode, the electrolyte is kept circulating from one vat to the other, and from the last vat it flows into a collecting tank, whence it is pumped back into each row, thereby maintaining a constant circulation of the solution. When the anodes are about spent, or eaten away by the action of the current, the cathodes are hoisted from the vats and a sheet of lead, 99.999 per cent. pure, is stripped from the steel plate and recast into bars, ready for shipment to the manufacturer of lead products. The anodes are then transferred to a separate vat, where the impurities, which have remained as a muddy slime, are



## LEAD REFINING AT TRAIL, B.C.

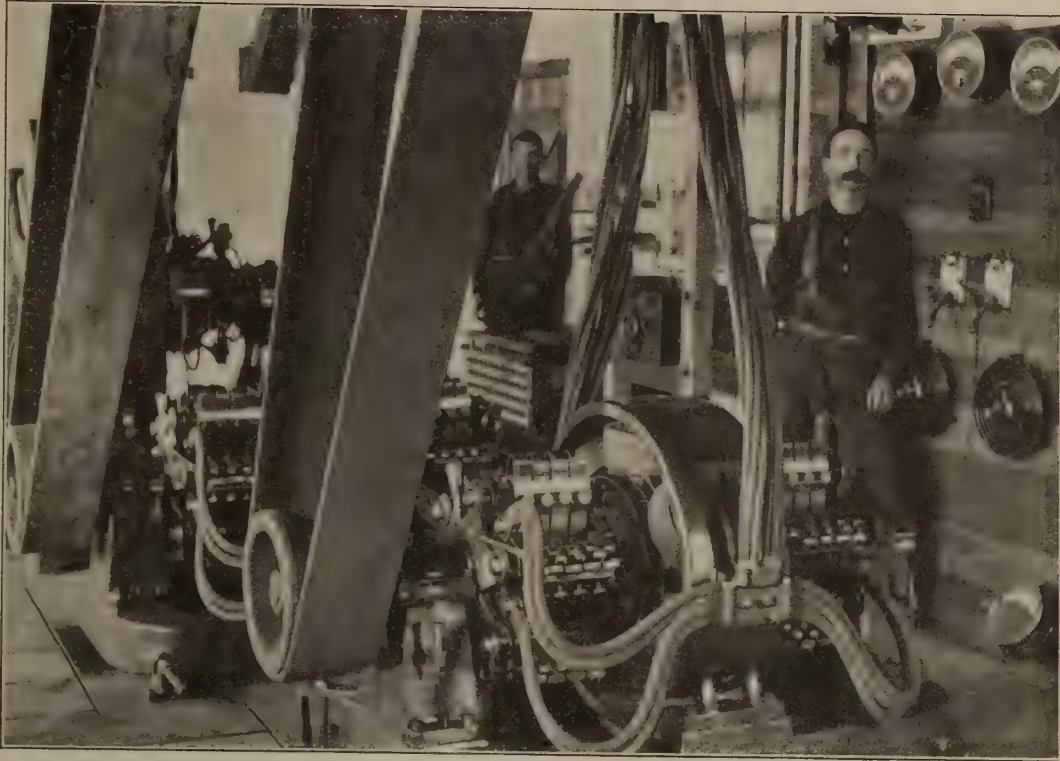


Lead Refinery at Trail, B.C., showing, on the right, lead bullion ready for the vats, and, on the left, pure commercial pig lead.



Vat Room of the new Lead Refinery of the Canadian Smelting Works at Trail, B.C.





Dynamo Room of the new Lead Refining Plant at Trail, B.C.

washed from the skeleton sheets of lead, which sheets are recast into anodes, to undergo the same process of refining. About 15 per cent. of the original anode remains unspent when the slimes are removed. The impurities, or slimes, are of such a nature that they cannot be economically treated on a small scale at Trail, and for the present are being dried, boxed and shipped to the States, where the values are separated and marketed.

The solution used as an electrolyte contains lead fluosilicate and fluosilicic acid. It is prepared at the works by the simple solution of quartz in hydrofluoric acid, with the subsequent addition of lead carbonate or white lead. The white lead dissolves, with effervescence, to lead fluosilicate. This solution answers very well for an electrolyte, for the lead fluosilicate is very soluble in water. The salt does not crystallize on the sides of the tanks and the solution has no odour, nor is it otherwise disagreeable.

The Trail plant was erected on merely an experimental scale, and will be increased immediately. Its present capacity is seven tons per day.

The process is bound, eventually to replace the Parker process of desilverizing with zinc, on account of the greater economy possible in the cost of working, and the completeness of the recovery of the metal values, in much the same way that the Parker process has supplanted the Pattison process.

#### Imports of Mining Machinery.

The imports of free mining and smelting machinery during the month of November amounted to \$56,292, of which \$55,270 came from the United States. Dutiable mining machinery of a value of \$9,395 was also brought in, bringing the total for the month up to \$65,687. The total value of the imports for the eleven months, exclusive of diamond drills, amounted to \$803,097.

#### The Walker Mining Co.

Just as we go to press we have received a copy of the prospectus of the Walker Mining Company which is offering in New York a bond issue amounting to \$400,000. The company, which has been promoted by Mr. W. H. Walker, an Ottawa barrister, has been formed with an authorised capital of \$1,125,000, in \$100 shares, to acquire and work about 2,000 acres of graphite lands in the township of Buckingham, Ottawa county, Province of Quebec. This property has had a notoriously disastrous career and we should imagine quite a million dollars of British and Canadian capital have been sunk upon its exploitation during the past twenty years. It is not, however, our intention to comment upon this enterprise in this number of the REVIEW further than to say that while the property has undeniably some merit, the milling and concentrating plant is faulty and will require to be completely overhauled, while better business methods must be adopted by the management if the new enterprise is to be made what we all wish it to be—a commercial success. In our next REVIEW we may have something further to say about this prospectus.

#### Canadian Mining Institute.

Arrangements are well advanced for the annual meetings of the Institute to be held at Montreal on 4th, 5th and 6th of March next. The syllabus of papers is as usual a large one, embracing many topics of interest to Canadian mine managers and mining engineers.

Early in April the Institute will hold a meeting at Victoria, B.C., in conjunction with the B.C. Mine Owner's Association, and in August, in conjunction with the Lake Superior Mining Institute, an important series of meetings and excursions will be held at Sault Ste. Marie.

It is gratifying to learn that there has been a large increase in the membership of the Institute during the past year.



### The Royalty Tax in B.C.

The Rossland Board of Trade has passed a resolution memorializing the Government of British Columbia to abolish the two per cent. mineral tax on account of the particularly burdensome restrictions which it imposes upon the production of low grade ores. The Resolution recites as follows:—"It differs from all ordinary forms of taxation in having a peculiarly repressive effect on the mining industry. This effect is not apparent on its face and is not measured by the amounts paid under it. It is nothing less than the stoppage or limitation of most new enterprises for the mining and treatment of low grade ores. Universal experience proves that the industry never becomes permanent until these ores are utilized, and any bar to this is fatal.

"The reason for this effect is that in going to ore of lower grade with a smaller margin of profit, the tax seizes a greater and greater percentage of the net profits. To illustrate on Rossland ores:—

#### HIGH GRADE SMELTING ORE.

|                                     |         |
|-------------------------------------|---------|
| Assume gross value of.....          | \$16 00 |
| Cost of freight and smelting .....  | 6 00    |
| Amount received by mine.....        | \$10 00 |
| Cost of mining and development..... | \$4 50  |
| Net profit.....                     | \$5 50  |

"The two per cent. tax figured on the above \$10 is a 20 per cent. tax which amounts to 3.6 per cent. of the net profit.

#### LOWER GRADE SMELTING ORE.

|                                     |         |
|-------------------------------------|---------|
| Assume gross value of.....          | \$12 00 |
| Cost of freight and smelting .....  | 6 00    |
| Amount received by mine .....       | \$6 00  |
| Cost of mining and development..... | 4 50    |
| Net profit.....                     | 1 50    |

"The two per cent. tax figured on the above \$6 is now 12 cents or 8.0 per cent. of the net profit.

#### HIGH GRADE MILLING ORE.

|                                                                   |        |
|-------------------------------------------------------------------|--------|
| Assume gross value of.....                                        | \$8 00 |
| Cost of milling and smelting concentrates with tailings loss..... | 4 00   |
| Amount received by mine.....                                      | \$4 00 |
| Cost of mining and development on larger scale...                 | \$3 50 |
| Net profit.....                                                   | \$0 50 |

"The two per cent. tax figured on the above \$4 is eight cents or 16 per cent. of the net profits.

#### LOW GRADE MILLING ORE.

|                                                                      |        |
|----------------------------------------------------------------------|--------|
| Assume gross value of.....                                           | \$6 00 |
| Cost of milling and smelting concentrates with tailings loss.....    | 3 25   |
| Amount received by mine .....                                        | \$2 75 |
| Cost of mining on larger scale, (ore bodies already developed) ..... | 2 50   |
| Net profit.....                                                      | \$0 25 |

"The two per cent. tax figured on the above \$2.75 is 5.5 per cent. or 22 per cent. of the net profits.

"It is needless to say that business enterprises cannot stand the confiscation of such large percentages of their profits. It is practically impossible to reform the tax so as to prevent this peculiar effect, and there is no escape from the two alternatives—either to suffer this effect or to abolish the tax.

"The low grade resources of British Columbia are practically unlimited, and this tax has long been the chief barrier to their development. The vast quantities known to exist in the Rossland ore deposits cannot be utilized until this bar to investors is removed. The Rossland Board of Trade desires to press this policy, not only for the benefits to its own district, but on the ground of the general relief which will be afforded to all the mining districts of the Province."

## CORRESPONDENCE.

### The Question of Free Coal.

To the Editor,

THE CANADIAN MINING REVIEW.

The opponents of reciprocity in free coal between Canada and the United States have not been slow to point out that the recent legislation at Washington is only a temporary expedient, devised to allay excitement in the States and to tide the politicians over a difficulty, and they are urging that on that account it should be entirely disregarded by Canadians. Even the least informed among Canadian newspapers have fallen into this sophistical line of agreement and have done their best to pooh pooh any suggestion which would lead to reciprocal action on the part of our Government. Undoubtedly this is a short-sighted view, although it would be as great a mistake to rush to the other extreme and to conclude that the action recently taken will be confirmed after the expiration of the twelve months now contemplated. We believe that the safe and wise position for the Canadian Government to take is that this action of the United States Government, from whatever motive it may spring, furnishes an opportunity which we have been seeking for years. To test the possibility of establishing a permanent agreement between the two countries for reciprocity in free coal. We propose to show that Canada has everything to gain and nothing to lose by accepting the challenge which has been thrown down, that if we take our friends at their word and pass similar legislation at Ottawa during the coming session it cannot have a prejudicial effect upon any branch of Canadian industries during 1903, and that we should be in a far stronger position if we were driven to abandon this reciprocal action by the retrocession of the American Government from the position they have just taken up than if we had not received their legislative overtures in the spirit in which we have a right to suppose they were intended. To question the "bona fides" of a friendly Government and refuse to follow their lead although we have professed to seek it for years, is to shut the door upon mutual agreements and to perpetuate the coal tax which Canadian consumers have paid, as we believe unnecessarily, for so long.

Let us examine the advantages and disadvantages of a reciprocal free coal agreement with the U. S. Government. It is obvious that in no instance could such an agreement work to the disadvantage of the consumer in any part of Canada as it would simply enable him to follow the natural law of purchasing his fuel in the cheapest market, whether Canadian or foreign. We are therefore confined to a consideration of the possible effect upon the producer in whose interest alone the present protective tariff exists. Now in this connection, what are the facts? There are only two coal producing districts in the Dominion of Canada, the one bordering on the Atlantic and the other on the Pacific. To deal with the latter first. The production at the Coast Collieries during 1902 was 1,200,000 tons, of which approximately 700,000 tons were exported, to the U. S., mainly to San Francisco, in spite of the existing duty. In the Crows Nest Pass the production of coal for the year was 425,000 tons of which more than one half was exported to the States, either as coal or coke, this again in spite of the duty. These figures are sufficient to indicate that local conditions prevail to such an extent that in the west Canadian coal is indispensable to our neighbours south of the line, and that the effect of removing the duty would be vastly to increase our market. Incidentally it may be mentioned that Mr. J. J. Hill, who has a large interest in British Columbia coal mines, was one of the first to place himself on record in favour of free coal, and in this connection we should point out how greatly it would benefit the coast collieries, which have during the past two years felt very keenly the competition of crude oil for fuel purposes. It will be within the recollection of our readers, how, in his last annual report, Mr. S. M.



Robins, the general manager of the New Vancouver Coal Co., anticipated the extinction of his American export trade in consequence of the competition of oil. Nothing could be clearer than that the removal of the duty would have a momentous effect upon the future of the coast mines.

Coming to Nova Scotia, the situation is different, because there is a common market within reach of the Canadian mines and of those operating in Pennsylvania, the possession of which is practically dominated by the question of tariff, or no tariff. From 1892 for several years the Dominion Coal Co. were fighting for free coal into the States. It is not necessary now to recapitulate the very voluminous and forcible arguments put forward by Mr. Whitney, and supported by all the chief officials of his company at that time. It is no exaggeration to say that according to their statement of the case, which lies before us as we write, the future success of their gigantic enterprise was dependent on their securing this measure.

It is a matter of history how, at the last moment, their project was frustrated in the Senate and their prospect of getting free coal received its quietus with the downfall of the Cleveland administration. If free coal was so desirable in 1892 and 1893 as to be almost a necessity for the survival of Nova Scotia mining, have the conditions since then changed so much that it is no longer desirable? Or, to what extent have the conditions modified the desirability? The one important factor which is causing Nova Scotia producers at the moment to look shyly upon any reciprocal action upon the part of the Canadian Government is that they are overwhelmed with orders, are unable to supply the present demand, and therefore, quite naturally, do not appreciate the necessity for securing any new markets. This is a delightful state of things, and one which, if its permanence could be guaranteed, might be extremely satisfactory to the various coal companies, but unless all history is to be belied, the present abnormal demand will before long begin to slacken with the inevitable consequences of reduced selling prices and reduced wages, and unless we are very much mistaken, in less than two years the question of a market for 1,000,000 tons of Nova Scotia coal a year will be a matter of weighty consideration. The mine owners may be under the impression that the present boom will last, but the only possible justification for this line of argument would be found in the fact that the natural development of our own country is so great that the coal producers have not yet overtaken it, and also that it will continue to furnish them with all the market they require. We think we can show that such an argument is fallacious. A study of the distribution of coal output from Nova Scotia for 1902, shows that 800,000 tons have been sent to the United States and 20,000 tons to Europe. No one who has studied the question believes that in a depressed time of trade it would be possible to export a ton of Nova Scotia coal into the States, for instance, except under some special contract, such as that existing between the Dominion Coal Co. and the Everett Gas Co., nor would it be possible to send coal to Europe when the selling price of the English product has fallen to a normal figure, except under similar conditions. With the expiration of the Everett contract, at an early date, the Dominion Coal Co. will have from 500,000 to 800,000 tons of coal for which they will have to seek a new market. Where will they place it? In Canada? Not unless even the present excessively busy time continues and the demand increases. Certainly not in Europe, as there is every indication that long before 1905 prices will have fallen to a practically unremunerative level. But not only will there be this surplus from the Dominion Coal Co., but all other Nova Scotia companies exporting coal to the States will find themselves face to face with the same difficulty. If, however, the duty of 60 cents were removed there is no reason, as was very properly contended by the Dominion Coal Co. in 1892 and 1893, why the Nova Scotia mines should not practically dominate the New England market.

In these States the consumption of soft coal now approximates to 10,000,000 tons a year. The distance from Nova Scotia ports to Boston is about equal to the distance from Newport News or Norfolk to Boston. In ordinary time American coal f.o.b. alongside Boston averages \$3.40 per ton, made up as follows:—

|                                      |        |
|--------------------------------------|--------|
| Cost of coal per ton .....           | \$1.00 |
| Average freight to Newport News..... | 1.30   |
| Insurance, sales, expenses, etc..... | .10    |
| Average ocean freight.....           | 1.00   |
| Total. ....                          | \$3.40 |

Now compare this with the cost of laying down Nova Scotia coal at Boston without duty:—

|                                            |        |
|--------------------------------------------|--------|
| Cost of coal f.o.b. Sydney or Louisburg... | \$1.25 |
| Ocean freight to Boston.....               | 1.00   |
| Insurance and sales expenses.....          | .10    |
| Total.....                                 | \$2.35 |

This would give the Nova Scotia producer a clear profit of \$1.00 per ton, or in other words, allow practically \$2.00 per ton f.o.b. for his coal, sufficient one would think in all conscience, but beyond that, as these figures clearly show, it would allow him a very considerable and elastic margin upon which he could trade under stress of circumstances. It is quite conceivable that this large market does not appear so desirable to the producer now as it did ten years ago, and it is true also that he sees in the gigantic industrial developments of his own Province a guarantee for a steadier trade than could have been possible at that time; but there is another side to this question in which the public are greatly interested, and that is the unbounded capacity of the Nova Scotia coal fields if properly developed.

The most competent experts have not reached the limit of possibilities in computing the contents of the Nova Scotia coal areas, largely due to the fact that the submarine areas cannot be investigated, and that there are large outlying tracts of country where it is possible and indeed probable that coal measures exist at a greater depth than has yet been explored, but the best judges agree that there are not less than 2,000,000,000 tons of workable coal in the Provinces, and in any event the quantity is almost beyond conception. Are we then to be satisfied with an annual production of 5,000,000, or even with a steady annual increase of some half million tons? We have for years regarded 10,000,000 to 15,000,000 tons per annum as a small output for the Maritime Provinces, and if free coal could be established and maintained with the United States, there is every reason to believe that nearly the whole of the 10,000,000 tons consumed in the New England States could be produced in Canada, thus raising the output of the Nova Scotia mines within a few years to something like 20,000,000 tons, due allowance being made for the natural expansion of our own industries. What this would mean for the country at large can better be imagined than described. It would certainly mean an unprecedented development in the Maritime Provinces, a large increase of population, and the establishment of many manufacturing industries which would use up the crude material now being produced at our large iron and steel works.

The gist of our argument in this article is, that the coal producers of Nova Scotia should not be permitted, if that is their tendency, to rest content with existing tariff conditions, because they are at the moment reaping a golden harvest, but that the interests of the country demand that, whilst befriending and protecting our industries, we should at the same time keep in view the broader question of the general prosperity of the country and the policy that will most assuredly conduce to that end. The only argument put forward at present by Nova Scotia operators who are opposed to action on the part of the Canadian



Government in this matter does not contest the fact that such action would give them control of the New England market, but is based entirely upon the contention that they would lose the St. Lawrence market, added to which representatives of the Dominion Coal Co. have argued that it would be a hardship for them to have to spend half a million dollars in providing suitable unloading stages and piers in the States for a trade that might not be permanent, especially as during the last ten years they have been put to similar expense in establishing those on the St. Lawrence. The answer to this contention seems to us to be very obvious. It is that whatever amounts have been spent on the St. Lawrence for these purposes have already yielded a very handsome return, and the structures provided will continue to be used whatever may be done in this matter of the tariff, and therefore that if similar amounts require to be spent elsewhere they are simply ordinary business expenditures to be incurred by any trader and not involving hardship of any kind. Not even coal companies have a right to ask protection against all the contingencies of the business in which they engage. They do not share their dividends with the country, and in taking all the profit must be prepared to sustain some of the disadvantages. But we agree with eminent authorities that the cry of losing the St. Lawrence market is simply a cry of "Wolf," and that it is absolutely impossible under any conceivable conditions for American soft coal to compete with the Nova Scotia product on the St. Lawrence, at any rate as far west as Montreal, and as practically no coal from the Maritime Provinces has ever been sold beyond that point it need not be considered in this discussion. The actual cost of laying down a ton of Cape Breton coal by water in Montreal does not exceed \$2.00. For many years large contracts were made in Montreal at prices ranging from \$2.25 to \$2.50. During the present boom the cost of production has probably increased in some instances as much as 50 cents, but has ranged from 25 cents to 50 cents, while the selling price has increased \$1.50. Without objecting in the least to the figures, which in exceptional times mine owners have been able to realize for their product, and remembering the many lean years which preceded the present years of plenty, we are very much disposed to think that the real crux of the question with them is not the fear of losing this market but of having to reduce their price. This, however, is not an argument which avails, because, as we shall presently show, the margin between the cost of Nova Scotia and American coal laid down in Montreal is so great that under no conditions could it leave the Nova Scotia producer less than a fair average profit. Allowing the American mine operator \$1.00 per ton for his coal, f.o.b., the lowest cost of transportation from Ohio or Pennsylvania points to Montreal would be \$1.90, making a total cost of \$2.90. Between this and the Nova Scotia figure there is surely sufficient difference to satisfy any reasonable demand for profit.

In this argument we have made no reference to the important consideration of quality and the difficulty of disturbing Nova Scotia coal in the industries which have been using it for many years, and have found it thoroughly satisfactory. It might be urged that this argument cuts both ways, and that for a similar reason consumers in the New England market might be slow in purchasing Nova Scotia coal; such, however, is not the fact, because they have for many years been purchasing a small quantity, are well acquainted with its characteristics, and have demonstrated that it suits their requirements.

The last word to be said on this important subject, having as we believe successfully demonstrated that the producers would not suffer, and that while they might have to accept a lower price in the St. Lawrence market, they would still have a respectable margin of profit, with the added gain of a large new market in the States, which would more than double their present output, is that there is one section of our countrymen who would derive even a greater advantage from free coal. In Ontario and all through Central Canada geographical position

determines that all our coal must be imported from the States. At present we are bringing in approximately 3,000,000 tons a year with a continual increase. Free coal would mean at the present time \$2,000,000 a year to Ontario. Viewed from the national standpoint this should indeed be regarded as a weighty consideration, and in all the premises, should, in our opinion, be sufficient to determine the Canadian Government at any rate to test the possibilities by reciprocating the action of the Government at Washington. We may point out that if this were done for one year, and no one would suggest at the moment anything different, it could not possibly affect mine owners prejudicially, because during that time at any rate they will not need to seek any new market. If, at the expiration of that time, the United States Government entered into an agreement with our own, renewing the arrangement for a term of years, we are satisfied that the ultimate gain to this country would be enormous without in any way injuring the position of our own coal producers, which would be the last thing your excellent journal would ever dream of doing.

W. BLAKEMORE.

MONTREAL, 22nd January, 1903.

### Mining and Smelting in the Boundary District in 1902.

British Columbia's banner mining district is undoubtedly the Boundary, if general progress and results from an ore shipping standpoint can be taken as any criterion. Notwithstanding the many drawbacks that have prevailed during the past years for which neither mine workers nor mine owners were responsible, taken altogether, the calendar year of 1902 has shown a remarkable advancement in the Boundary.

In the matter of ore shipments first, the records show that in the year 1900—the year the Canadian Pacific Railway completed its four million dollar branch to the Boundary—a little less than 100,000 tons of ore were shipped. In 1901 the shipments increased to 390,000 tons for the full twelve months. In 1902, the figures for the last few days being estimated, and subject to slight correction, the splendid total of over 500,000 tons was reached, or an increase of nearly, or quite, 25 per cent over the previous year—nearly all the ore coming from six mines.

Had it not been for the unfortunate events following the terrible explosion in the Fernie coal mines in East Kootenay in May, whence only the coke supply for our smelters can be obtained at a price that will admit of a profit in treating our ores, there is every reason to believe that this record would have been much larger than it is. The ore was and is ready to be extracted from Boundary mines in almost unlimited quantities, the miners were satisfied with prevailing conditions, capital was available, and the three smelters were prepared to handle the output as fast as it could be delivered to them.

During the past year a few mines have been regular shippers from the Boundary district. As there are six of these that have figured steadily in the weekly reports of tonnage, they have become to be known as the "Big Six." They are the Granby and Snowshoe mines in Phoenix camp; the Mother Lode and Sunset mines in Deadwood camp; and the B.C., and Emma mines in Summit camp. The only one of these that has shipped regularly every week during the year was the Granby, with the Mother Lode as a close second in this regard. A few other smaller properties have contributed to the grand total.

In point of relative importance, as shown by the ore tonnage, and consequently the values recovered, these mines may be placed in the following order: Granby mines, Mother Lode, Snowshoe, B.C. mine, Sunset and Emma. Three of these properties have shipped only to their own smelters, namely, the Granby, Mother Lode and Sunset. Referring to the details of shipments from each mine, the following table will give the average respective tonnage of each, as nearly as it could



be ascertained without the actual data for the last few days, which has not yet been made up in all cases :

| Mine                               | Tons    |
|------------------------------------|---------|
| Granby mines, Phoenix camp.....    | 309,715 |
| Snowshoe, Phoenix camp.....        | 21,158  |
| Mother Lode, Deadwood camp.....    | 144,671 |
| Sunset, Deadwood camp.....         | 11,615  |
| B.C. mine, Summit camp.....        | 15,024  |
| Emma, Summit camp.....             | 11,478  |
| Winnipeg, Wellington camp.....     | 785     |
| Golden Crown, Wellington camp..... | 625     |
| No. 7 mine, Central camp.....      | 482     |
| Jewel, Long Lake camp.....         | 2,175   |
| Sundry small shipments.....        | 2,300   |

Total for year 1902..... 520,026

One feature of the ore shipments from the Boundary for the past year is the fact that the month of December shows the largest tonnage of any other single month, being not far from 60,000 tons, and this notwithstanding that three of the furnaces in the three smelters were cold a part of the month. The next largest month of the year was October, when about 55,000 tons were mined and sent down to the smelters.

Throughout the year 1902 two of the Boundary's three smelters namely, the Granby and Mother Lode, were running continuously with the exception of the time when the coke supplies were cut off in the summer. At the Sunset smelter active operations were only begun about the time that the coke troubles started, but this smelter also has been running steadily since the coke began coming forward regularly after the settlement of the coal miners' strike in East Kootenay.

The Granby smelter is located at Grand Forks, having four furnaces and two copper converters, which latter handle the matte from the other two Boundary smelters also, and is a most complete plant in every way. Two additional furnaces have been ordered recently in Chicago, which will give a combined capacity for these reduction works of six furnaces, or 2,200 tons of ore daily. This smelter takes but little outside ore, with the exception of some Republic ore, which is largely used as converter linings. The ore nearly all comes from the company's mines in Phoenix camp.

The Mother Lode smelter is located at Greenwood, and is also very complete, having two furnaces, it being understood that two more furnaces will be added during the coming year. Mother Lode and some custom ore is reduced at this smelter, including shipments from the Snowshoe and B.C. mines.

The Sunset smelter is located at Boundary Falls, four miles below Greenwood, and was originally constructed by the Standard Pyritic Smelting Co. It was not blown in, however, until purchased and remodelled by the Montreal and Boston Copper Company last spring and summer. The same company owns and operates the Sunset mine in Deadwood camp, taking also at the smelter ores from Snowshoe and B.C. mines. The Sunset smelter now has one furnace, is installing second, to be ready for use in a few weeks, and has placed an order for a third, to be placed in commission in the spring.

Boundary's three smelters have reduced 500,000 tons of ore during 1902. The Granby smelter, which is the largest, has handled about three-fifths of this tonnage, the Mother Lode a third, and the Sunset smelter the balance. With twelve or thirteen furnaces in operation in 1903, the tonnage for that year should reach pretty close to the million mark.

Boundary mines have not yet quite gotten to the stage where dividends have been paid. As is usual with low grade properties, it requires years of development and the investment of much capital in an intelligent manner to reach this point. A fall of several cents in the price of copper has also had its effect. Nevertheless, several of them give promise of entering the dividend class in 1903. This being the case nothing official has yet been given to the public regarding the exact values of the ores being handled.

In this section the ore from the different mines is nearly all of the copper—gold variety, and generally speaking is well known to be of a low grade—but there are literally mountains of it, and the expense of extraction is reduced to the minimum. The values have been variously estimated at from \$4 to \$6 per ton, so that probably \$5 per ton is a fair average. On this basis the mines of the Boundary have produced during 1902 ore that contained values amounting to over \$2,000,000, the values being in copper, gold and silver, in the ordered named.

A few mines have been developing during the year having shown high values, notably the Providence, near Greenwood, from which a few cars have been shipped to the smelter running from \$100 to \$150 per ton. But the general run in the ore is low, and it is only by using the most modern equipment in both mines and smelters that the properties can be made to reach a profitable basis, as it is now believed they have.

One feature of the development in the Boundary mines this year is the system of open quarrying of ore, first used only at the Granby mines, but now adopted to a greater or less extent to advantage by all the large shipping mines of the district. By this plan the expense of hoisting is done away with, the ore being broken down and run by gravity to the railway dump cars. It promises to be used much more extensively in the future, as it is a most economical method of getting out large quantities of ore.

W.

#### A Modern Coarse Concentration Plant for Silver Lead Ore.\*

By ERNEST R. WOAKES, Nelson, B.C.

Of late years there have been so many improvements made in the machinery used for crushing and concentrating, and in the design of plants for this purpose, that a short description of an up-to-date concentrator of a quite simple construction cannot fail to be of interest to the members of this Institution.

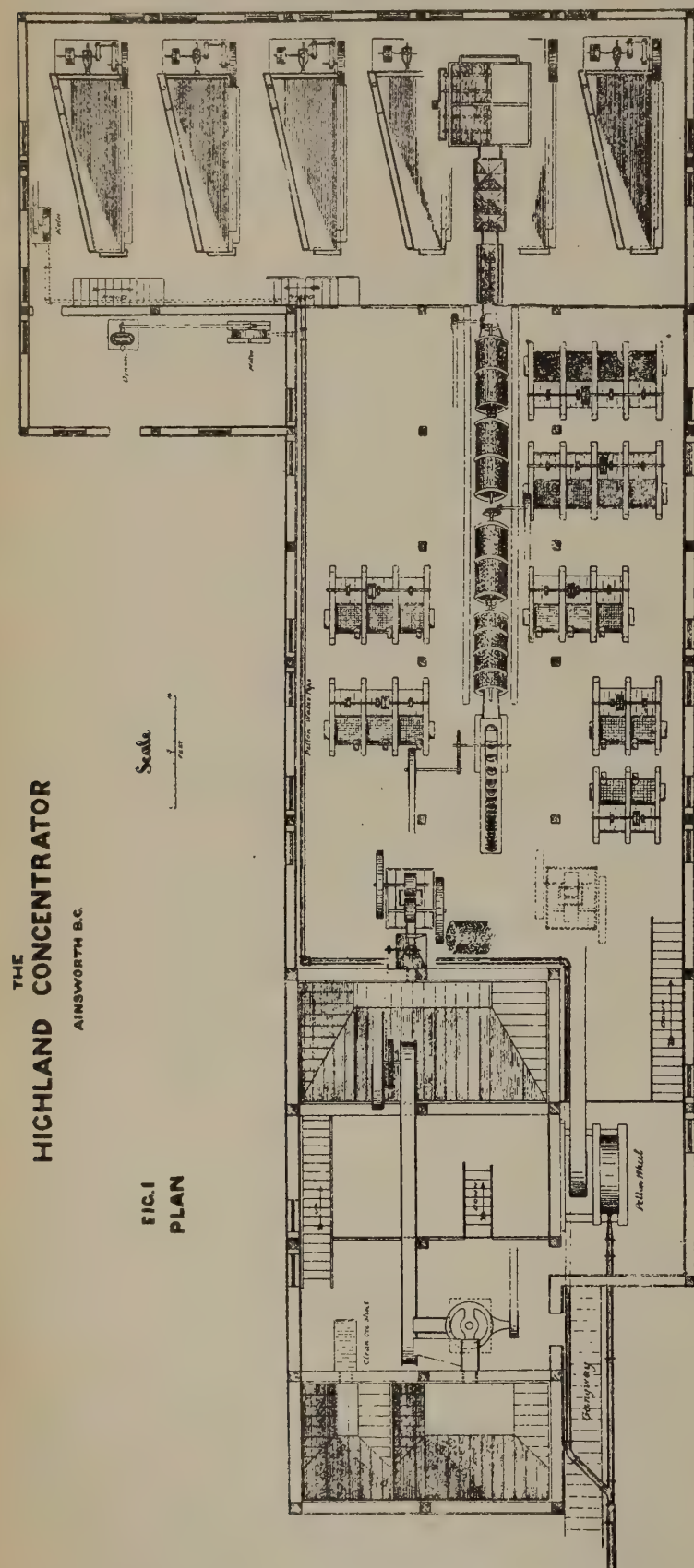
Regarding first the improvements that have been made in the crushing machinery, we find these to be confined almost entirely to the rolls, for although the rotary rock-breakers of the Gates type are undoubtedly better for very large plants, the old Blake crusher is hard to beat. When we come to the improvements in concentrating machinery we find these are confined to the various devices for concentrating the fine products of the mill, the old buddle, both stationery and revolving, having been quite superseded by the modern tables and vanners, whilst the old concentrating machine *par excellence*, the jig, still hold its own, though many have tried to improve it to death.

The improvements in the design of the mills are no less marked than those in the machinery, and have mostly been made with the view of obviating the handling and re-handling the various products by hand; indeed the contrast in this respect between a 100-ton concentrator, such as is to be described in this paper, and a similar plant of twenty years ago is most marked. In the former three men alone look after the various machines, and 100 tons of concentrating ore is crushed and concentrated and the concentrates delivered by gravity into the concentrate bins below the mill in each shift of twelve hours without a pound of ore being touched by hand; indeed, it is not necessary to have a shovel or barrow in the mill. In the old mills, or dressing floors as they were appropriately called, the plant was spread out over acres of ground and a regiment of men, women, and children were kept busy with hoes, shovels and barrows, whilst miniature mountains of heads, middlings, and tailings were piled up in all directions. The following amusing incident occurred some years ago on the dressing floors of a silver lead mine in South America. The manager noticed that the piles of middlings were accumulating on the buddle floor and remon-

\*A paper to be read before the Institution of Mining and Metallurgy.



strated with the Welsh foreman; the ore was coming pretty rich at the time and the foreman did his best with the appliances available, but still the middling piles increased in size. Then the manager began to use more forcible language and said some means must be found to work off the pile and prevent the useless locking up of capital. The next time the manager came round he had nothing but smiles and good



The Highland concentrator was designed and built to treat the ore from the Highland mine owned by The Highland (Kootenay B.C.) Mining Company, Limited. The problem to be solved, was a comparatively simple one, the character of the ore being such that practically all the silver values were carried by the galena; the pyrites, pyrrhotite and zinc blende carrying very small values. The ore was low grade in silver, carrying about  $\frac{1}{2}$  oz. silver to the unit of lead. It was evident, therefore, that a concentrator of such proportions was required as would treat a large amount of ore at the lowest possible cost. In fact, the concentrator should be a complete unit and such that each machine, or component part of that unit, should be so proportioned that the whole would treat the largest amount of material, whilst saving as large a percentage as possible of lead, at the lowest possible cost. The concentrator was to be to concentrators what a properly designed 40-stamp mill is to stamp mills,—namely, the most economical working unit of its class. The success or failure of a concentrator depends to a very large extent on this vital factor of proportion, it is so extremely difficult to say beforehand exactly how such and such an ore will crush, size, concentrate or slime, that it is by no means easy to arrive at all the proportions in the original design. It is of extreme importance that the coarse rolls should only crush the ore just to the size of the first or bull jig will save as much as possible of the coarsest and generally richest ore before it has been unduly broken up and slimed. In many cases, where the character of the ore to be treated is such that little regrinding is necessary, or that the galena separates itself easily from the gangue, an oversize jig, of ample dimensions, taking the product direct from coarse rolls and making tailings of a lot of partially crushed and worthless material, will be found to greatly increase the efficiency and capacity of a concentrator. These conditions do not exist in the ore from the Highland Mine where the gangue consists largely of quartz. Only one elevator is needed, if the contour of the ground at the mill site approaches at all nearly to that shown in accompanying drawings (see Fig. 2). The whole plant or unit should, if possible, be so designed that only one elevator is necessary, and that one must be of very ample dimensions, the arrangement of the coarse trommel below the coarse rolls, to be subsequently described, is of the greatest assistance in this respect. Each concentrating machine, from the coarsest to the finest, must have its own sizer; each sizer, whether it be revolving trommel, hydraulic sizer, or settling tank, must be proportioned to the machine it is going to feed, and the proof that this proportion is true will be seen if the tailings from the machine are so poor that they can be run directly to tailing's spout; that is to say, every machine in such a mill as is being described, with the possible exception of the coarse jig, must make tailings. Of course the writer is perfectly aware that there are cases where the silver values are carried in other minerals than the galena, where tailings require re-grinding and retreating, but such cases are rarer than would be imagined if the proportions of the subunits of the concentrator be right. In the cases where the silver values are chiefly carried by minerals whose specific gravity differs so slightly from those minerals that are desired to be separated out, it would seem to be courting disappointment to attempt a concentration by water.

The capacity of a concentrator is not to be gauged by the capacity of its crushing plant, but by the amount of concentrates and tailings it makes. The writer has seen some beautiful looking concentrators, full of high speed rolls and elevators, all crushing and elevating to their utmost capacity, but in reality being little more than complicated circulating machines. The flow sheet of these mills, if ever such sheets were prepared, would be most interesting.

Light and cleanliness are coexistent, both are necessary for successful concentration; the practice of putting the crushing rolls at the bottom of what is to all intents and purposes a dark and dirty cellar is neither good engineering practice nor at all necessary in the design

words for the foreman as there was no sign of the pile left. The foreman explained that he had found an improved method of working, and there would be no more piles of middlings in the future to worry the manager. The simple man had just shovelled them into the tailings launder, and they had gone down the creek where they would be a cause of no more irritation to anyone.

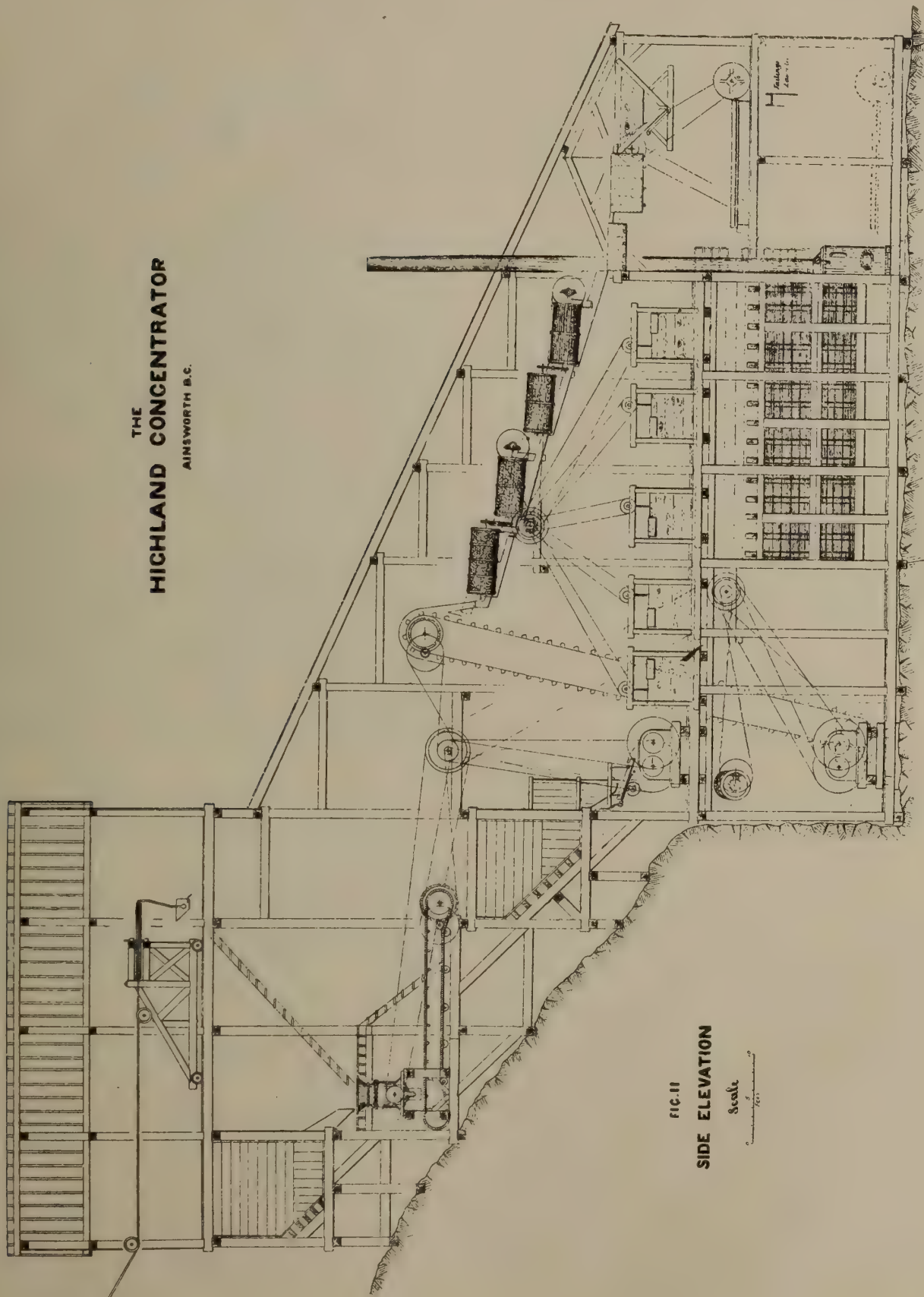


of a concentrating mill, yet in most cases it is done. This plan, moreover, entails the lower boot of the elevator being in an inaccessible situation and practically under water. A properly designed and proportioned elevator can be run at a higher speed, and consequently have a greater capacity with less wear and tear, than one that does not possess these merits.

By referring to the plan (Fig. 1) and elevation (Fig. 2), the general design of the Highland concentrator will be clearly understood. The cross section (Fig. 3) shows the arrangement of the concentrate bins on the ground floor of the mill, into which all the products of concentration drain by gravity and are then run by gravity into cars which are pushed

by hand over a platform weighing-machine on to a self-acting inclined tramway which transports them directly on to a wharf where they are automatically dumped into a barge on the lake.

The ore is brought down from the mine over an aerial rope tramway, on the Hallidie system, a distance of 4700 feet. At the upper terminal are separate ore bins for concentrating and clean ore; the breaks and automatic loader are worked by one man at that end. At the lower terminal, directly over the mill, as shown in the elevation is an automatic dumping and self-righting device, by means of which the tram buckets are dumped as they come over the ore bin and right themselves again before starting on the return journey to the mine. The ore





bins below the lower terminal are so arranged that concentrating ore is dumped before the buckets pass round the lower tail sheave of the tramway, and clean ore is dumped into a separate bin after the buckets have passed this sheave. When clean ore is being shipped over the tramway, it requires a man at lower terminal to attend to the dumping and righting of the buckets. The clean ore passes directly through an ore shoot to a lower ore bin on ground floor of mill, from whence it can be handled by same cars and arrangements as are used for shipping the concentrates. From the upper ore bin the concentrating ore passes over an inclined grizzly directly into a 3 D Gates crusher which discharges the crushed ore on to an 18-in. travelling belt conveyor, which delivers it into a second storage bin immediately above the coarse rolls.

Up to this stage the capacity of the plant is double that of the complete mill, the object being to run the tramway, crusher and conveyor, during day time only; thus two men operating this part of the plant are only required to work one shift. If it is necessary to sort out clean ore on the belt conveyor, an extra hand is required during the day shift, any ore so sorted out is dropped directly into a shoot that delivers it into the clean ore bin in basement. It is seldom, however, that it is desirable to sort out clean ore in the mill, this is done in the stopes in the mine.

The automatic feeder for the coarse rolls is an important item. The most satisfactory feeder is of very simple construction, and is shown in Fig. 2. It is a sheet steel trough made a little narrower than width of rolls and inclined slightly down to them, and arranged to work something like a bumping table, the backward motion being given to it by a revolving cam, a spring performing the forward motion and causing the bump against an adjustable stop. By means of this feeder a continuous stream of ore 3 in. to 4 in. thick, if desired, can be fed uniformly over the whole width of the rolls. The feed sample, to be afterwards described, can conveniently be taken from the stream of ore as it drops into the rolls.

**Rolls.**—These, are no doubt, the most important item of the crushing plant, and the efficacy of the whole depends on their performance. It is, therefore, necessary that they should be of the very best design procurable. It is also desirable that the rolls should be all of uniform pattern, so that spare parts of all rolls in the same mill are interchangeable. The fine roll shells, with their arbors, can be transferred bodily to the coarse rolls and there worn out, after they are too much worn for efficient fine crushing, the new shells generally being put in at the fine end of the process. The writer has not had the opportunity of seeing the Argall roll, lately described by the inventor in a paper read before this Institution, but the high-grade rolls of the Gates Ironworks, Chicago, embody most of the essentials of a first-class roll. The plant at the Highland Mill consists of three sets of these machines, 26 in. by 15 in. The coarse rolls are arranged to run at 85 revolutions per minute, the medium at 95 revolutions, and the fine at 105 revolutions. The speeds for the coarse and medium rolls are slightly higher than those advocated for dry-crushing by Mr. Philip Argall in the valuable paper above referred to. From his arguments I gather that speeds should be the same for both dry and wet crushing for rolls of same size, working under similar conditions as regards size of feed and crushed product; it would be interesting to know if this is really Mr. Argall's opinion. I was glad to see that Mr. Argall has shown so clearly the absurdity of the craze for high-speed rolls for ordinary crushing: no doubt a great deal of the trouble so frequently experienced with rolls is due to the excessive speeds at which it is attempted to run them.

The coarse rolls and automatic feeder are set up about 3 ft. above the level of the jig floor, immediately to one side of the elevator, and are shown in Fig. 5, taken from a photograph. The medium and fine rolls are set up in a similar way, one on either side of the elevator boot on the ground-floor of the mill; the latter cannot be seen in the elevation

(Fig. 2), it is eclipsed by the medium rolls. There are four twelve-light windows on either side of the building opposite to these rolls. Immediately below the coarse rolls is a revolving screen 36 in. diameter by 40 in. long punched with  $\frac{7}{8}$ -in. holes; the product from coarse rolls passes through this screen, the oversize going directly to medium rolls and screened stuff to elevator. The advantages of this preliminary screening are considerable, nothing that will not pass the screen goes to the elevator, any flat pieces of rock that get through the coarse rolls pass on to the medium rolls and are there reduced in size before being elevated to main trommels. This entails a large saving in wear and tear of elevator. The coarse screen also sizes for the coarse jig which is a single two-compartment Hartz jig, with eccentric adjustable to a 4-in. throw, the screening area of each compartment is 34 in. by 22 in., the

## THE HIGHLAND CONCENTRATOR

AINSWORTH B.C.

Scale  
feet

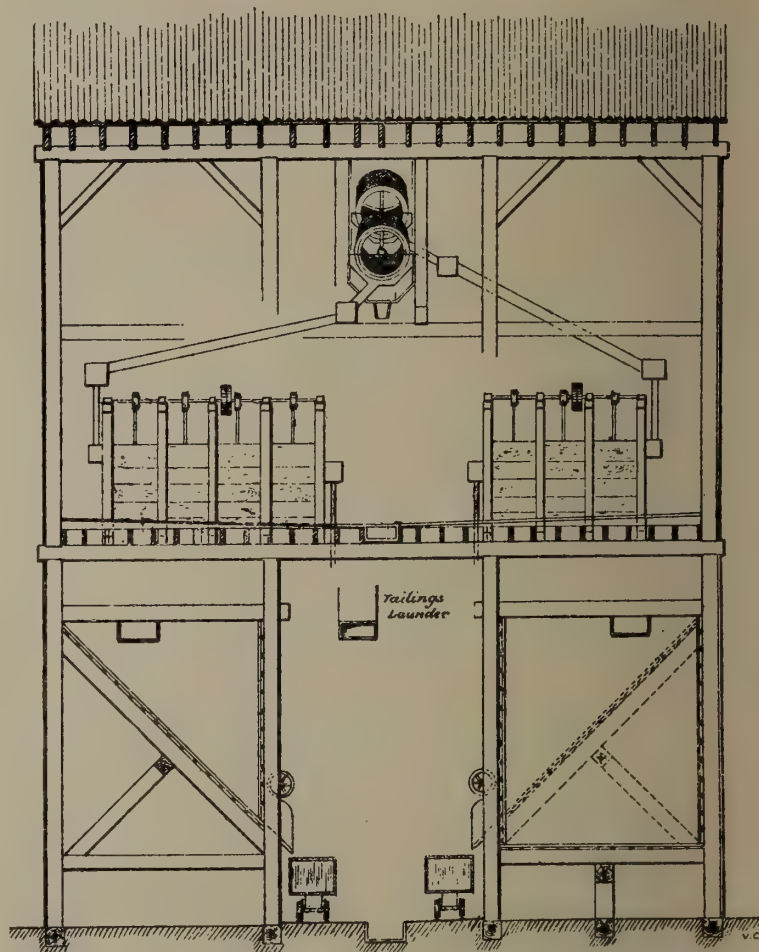


FIG. III

### CROSS SECTION

actual dimensions of screens being 36 in. by 24 in. The tailings from this jig are generally run directly to tailings spout, but if the feed is particularly good they are returned to medium rolls, as indicated by dotted line on flow sheet.

The elevator is 48.5 ft. between centres of upper and lower pulleys, and it is believed that this height should only be exceeded by a very few feet if the best work is to be got out of an elevator. The head pulley is 48 in. diameter and tail pulley 36 in. diameter, the belt is a 14 in. by eight-ply "leviathan" canvas belt, the buckets are spaced



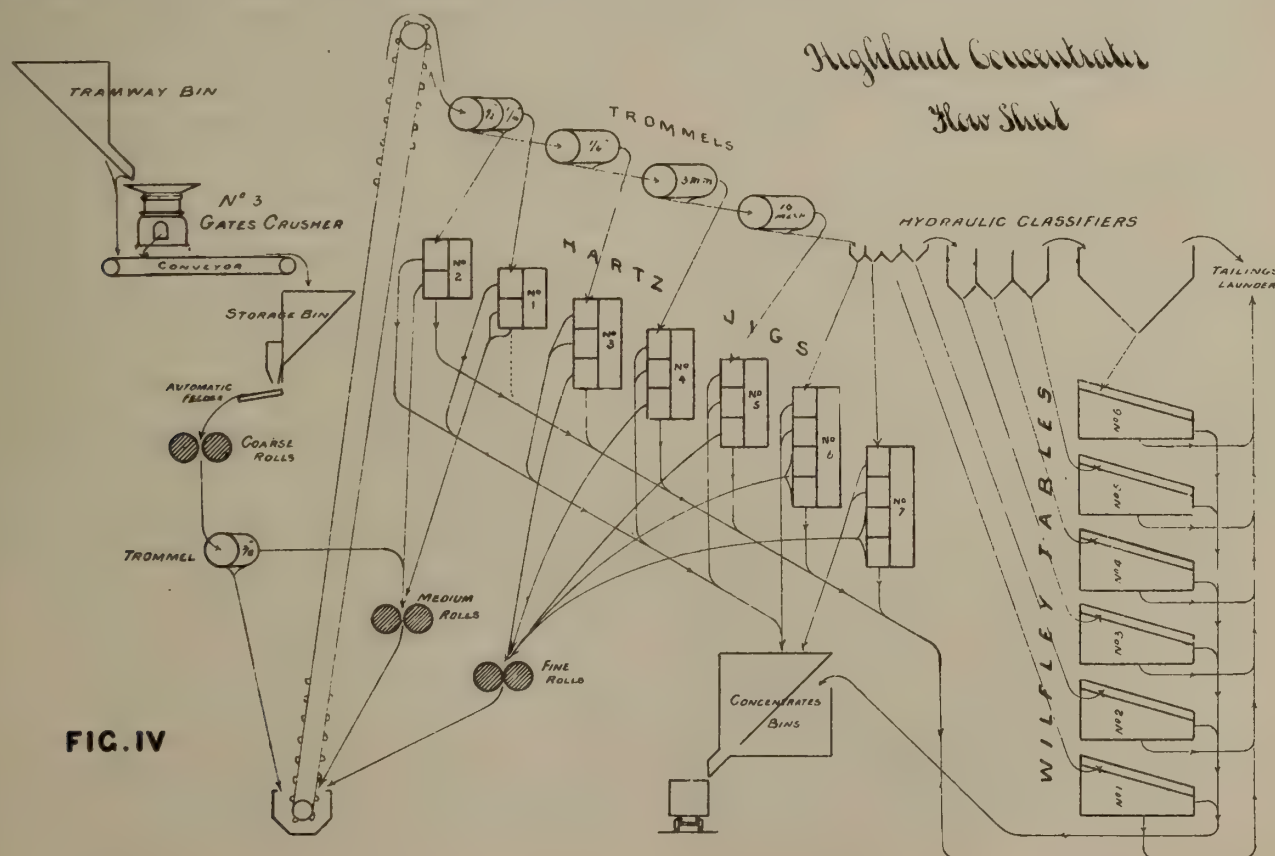
17 in. apart and are of No. 10 steel 12 in. by 6 in. The elevator has a geared drive, and runs at a speed of 350 ft. per minute. It worked very satisfactorily from the start and has shown a minimum of wear and tear.

The revolving sizing screens, or trommels, consist of four, all of ample dimensions; they are clearly shown in the plan and elevation of the mill. They are coupled up in sets of two which are separately driven by a geared drive. The driven screen drives the one above it by means of spurred gearing and not by sprocket wheel and chain. They are all 36 in. diameter, and housed in by large tongued and grooved wooden housings. The first trommel is 80 in. long, made in four sections, the first two of which have  $\frac{1}{2}$  in. punched holes and the second two  $\frac{1}{16}$  in. holes; the oversize from this trommel goes straight to the coarse jig, it having been already sized in the manner previously described. The material that passes through the  $\frac{1}{16}$  in. section goes to a two-compartment Hartz jig, similar to the coarse jig. The remaining three trommels are each 72 in. long and are covered respectively with  $\frac{1}{4}$  in. round punched steel—3 m.m. round punched steel and 16 mesh slot punched steel. They each deliver their sized product to their respective jigs.

The fine product passes from the trommels into a set of four hydraulic classifiers, modifications of the Lake Superior trough type of classifier. The series consist of a double V trough divided into hopper shaped sections of increasing area, the pulp flows through the inner trough passing over the divisions from one section to the next. Clean water, under slight pressure, is admitted into the space between the two troughs near the top of each section. There is an opening in the bottom of the inner trough, in the centre of each section which communicates with this space and opposite to the opening a piece of  $1\frac{1}{2}$  in. pipe passes through the outer trough through which the heavier material is drawn off passing in its course the upward current of clean water. The fines from the hydraulic classifiers then pass into two pointed settling boxes, the first being 6 ft. by 3 ft. by 3 ft. divided into three compartments respectively, 18 in., 24 in., and 30 in. long. The last settling box being 8 ft. square at top and 5 ft. deep. In the former the current is arrested by partitions and "diving" boards, the coarser products being drawn off in the 18 in. compartment and the fines in successive

stages in the larger ones. The opening in the bottom of each pointed box through which the sized pulp is delivered to its concentrating machine is connected with a goose neck or inverted syphon, which controls to a certain extent the amount of water that is delivered with the pulp. The water and fine slime overflows from the last large settling tank and goes to the tailings, whilst the fine settled product is taken off from the bottom by four goose necks and delivered to the last of the series of Wilfley tables. Wilfley tables were selected for the concentration of the fine products of the mill, the writer's experience being that they are the simplest and best machines for this class of work at present on the market. There was no difficulty in adjusting them, so that each machine made a clean product of the six different sizes with which they were severally fed.

We must now return to the jigs which take care of the products from the trommels. Besides the two coarse or bull jigs already referred to, there are three 3-compartment and two 4-compartment single Hartz jigs, with room on the jig floor for two more of the latter if found necessary. The jigs are all of the simple pattern above described, which is believed to be the best, but of very ample capacity, the screens in each compartment being 36 in. by 24 in. The fine jigs only deliver their product through the screens into the hutches. The jig frames and hutches were all constructed on the spot. The eccentrics are adjustable from 1 in. to 3 in. throw, and the concentrates from each pass by gravity into the concentrate bins below the jig floor. By referring to the flow sheet, shown in Fig. 4, the course or flow of the material from start to finish can be readily seen. Owing to the variations in the quality of the feed coming into the mill, it is impossible and undesirable to draw hard and fast lines for the flow of the material from the third and fourth compartments of the jigs. The jig attendant must watch and adjust the height of discharge of the compartments of each jig, so that whilst the feed is good enough some of the jigs will be making practically no tailings. It will be found to be the case with most ores that the galena favours a particular size when crushed: in the case being described, the first 3-compartment jig taking the oversize product from the  $\frac{1}{4}$  in. trommel generally made the most concentrates. The coarse product from the two first hydraulic classifiers goes to the two 4-compartment jigs, whilst the two remaining classifiers feed one each of the first





two Wilfley tables, the third, fourth, and fifth Wilfley being fed respectively by the three compartments of the first pointed settling box, the sixth Wilfley taking the fine product of the last one. The mill thus produces thirteen distinct sizes of concentrates.

The mill is operated entirely by water power. A 4-ft. Pelton Wheel, with deflecting nozzle, is placed on the top floor, about on a level with top of the elevator; this wheel runs under a head of 450 ft., and the power water from it is caught in a tank and used for concentration purposes. This arrangement is the best to adopt wherever possible, as the slight loss of head entailed is more than gained by the ample supply of water available for the feeds to the various machines in seasons when the water supply is short. A special feed water pipe is taken from this tank for the Wilfley tables. A 6-in. main is taken off the pipe line to the large Pelton wheel, and branches from it supply a 2-ft. Pelton motor to operate the Wilfley tables, and a 12-in. motor to run the dynamo which supplies a 220 volt. current for lighting the mill and offices and bunk houses, &c., at the mine. A fire hose service is provided on each floor from this 6 in. main. All the floors of the mill are heated by steam generated by a 10 h.p. boiler placed in the basement.

The crushing and concentrating machinery, shafting, pulleys and belting, with the exception of the Wilfley tables, were supplied by the Gates Ironworks, Chicago. The Pelton motors and gearing were supplied by the Pelton Water Wheel Co., San Francisco, and the Wilfley tables by the Mine & Smelter Supply Co., Denver, Colorado. The electric light plant was supplied and fitted by the Kootenay Electric Supply & Construction Co., Nelson, B.C. The erection of building and installation of machinery was done by the Highland Mining Company, under the superintendence of their foreman, Mr. J. A. Kelly.

The contour of the mill site and character of the bed-rock were such that no masonry was necessary. Lumber was cheap and was not spared in the construction of the building; 290,400 ft. of lumber and 118 twelve-light windows were used. The roof is of corrugated iron. By setting back the top ore bin and Gates crusher and using the conveyor belt to bring the ore forward to the storage bins, it was possible to set the whole of the upper works on a solid rock foundation, and at the same time reduce the height of the building. The sides of the mill are covered with two thicknesses of 1-in. dressed boards, with building paper between. The main driving-belts are "Leviathan" canvas brand, and the shaft-bearings are ball-and-socket type, with compression grease cups.

The cross section of the mill (Fig. 3) shows the construction of the concentrate ore bins and the inclination of the floors towards the centre, where there is a launder arranged to drain everything back into the elevator boot. Regarding the construction of these concentrate bins, it is necessary that great care be exercised in making them water-tight. The plan followed in this plant was to line them with double 2-in. tongued and grooved plank. A water-tight discharge door is made of wood, secured by wedges on the outside of the bins; outside this again is an ordinary ore bin gate, lifted by a rack and pinion. This latter is merely to regulate the discharge of the concentrates into the cars after the water-tight door has been removed. No difficulty was experienced in running the concentrates out of these bins. The bins for Wilfley concentrates are of different construction; the concentrates in them require to be shovelled into the cars. The discharge from the Wilfleys being at a lower level, the bins are made flat bottomed, as shown on right hand side of cross section (Fig. 3). The arrangement of the spouts or launders for carrying the crushed and sized ore to the various machines is indicated in this figure, and also in the photograph of Wilfley floor. These spouts should be as short as possible, the wear in them is great. Wherever a spout turns an angle, a box is provided; this prevents undue wear and the trouble from overflows. All the spouts

carrying material coarser than 16-mesh should be lined with sheet-iron not less than  $\frac{1}{4}$  in. thick. If there is an iron foundry in the district it will be found to be of very great saving, both in cost of material and time wasted in making repairs, to have these spouts lined with chilled cast iron plates  $\frac{1}{2}$ -in. thick. In this case the spouts should be made of uniform section, so that only two sizes of liners be required *i.e.*, liners for bottom and narrower ones for the sides. The side elevation of the mill (Fig. 2) will serve to show the general arrangement of the plant and especially the trommels, hydraulic classifiers, and pointed boxes. The lower floor, under the Wilfley floor, is used as a workshop, and for settling tanks for the overflow water from the concentrate bins. There is also room there for three more Wilfley tables (shown dotted in Fig. 2) to take the tailings each from a pair of Wilfleys on the floor overhead, an arrangement which should have all the advantages of double deck concentrators without some of their disadvantages.

Work was started grading out the mill site towards the end of August, 1900. The carpenters started framing the timbers on 15th September. The mill was completed and in operation on 18th January, 1901, and no stoppages for structural alterations have been made. The skilled labour employed was first class and highly paid. The total cost of the plant complete was as follows:—

|                                |             |
|--------------------------------|-------------|
| Machinery and hardware.....    | \$16,693.05 |
| Freight and duty on above..... | 4,126.98    |
| Lumber.....                    | 3,590.66    |
| Wages and Salaries.....        | 11,555.07   |
|                                | <hr/>       |
|                                | \$35,965.76 |

*Capacity of Plant, and cost of operation.*—The contractors for the machinery were required to guarantee that it would crush a minimum of 100 tons per 24 hours. After erection it was found that the capacity of the plant was nearly double that amount, and as it stands may safely be said to be capable of treating 180 tons per day of 24 hours. The addition of two extra jigs and the three Wilfleys above referred to would bring the capacity up to 200 tons. Under the above circumstances it has never been necessary to run the mill continuous 24 hour shifts. The capacity of the mine at the time being about 3,000 tons per month, which amount can be treated during one shift. Working under these conditions it is necessary to have a night watchman, who also attends to the running of the electric light plant. The concentrator requires three men besides the foreman and a blacksmith, the latter assists in running the concentrates out of the mill to the barge.

The cost per ton of ore crushed on the above basis comes out at a fraction over 29 cents. This includes cost of stores and materials used, and of placing the concentrates produced on the barge ready for shipment to smelter. It is evident, therefore, that by running the plant to its full capacity this cost would be very materially reduced only two more men being required to treat 6,000 tons per month. Under these conditions the cost would be reduced to probably less than 16 cents per ton.

Very careful tests were made of the efficiency of the mill as a concentrator. Samples were taken of the feed going into the coarse rolls every quarter-of-an-hour, and the bulk sample so obtained was assayed daily for a period extending over several months. A similar sample was taken of the tailings going out of the mill, and this latter was checked by the tailing samples taken from each machine. All the assays for lead were done by wet method. The above results, taken in conjunction with the actual amount of lead and silver contained in the concentrates produced, would give approximately the percentage of extraction obtained by the mill. By these means it was found that 81.5 p.c. of the lead was saved, whilst the average tailings assay for silver was 0.6 oz. per ton. These results may be taken as showing good concentration. It is not claimed that the above method of sampling is by any means perfect; in fact it is impossible to get an



accurate feed sample of a mill without an elaborate system of mechanical sampling and recrushing, which is obviously out of the question in a silver lead concentrator. There are many simple mechanical devices which will take fairly accurate samples of tailings, that known as Lamb's Automatic being one of the most satisfactory. It is manufactured by The Allis Chalmers Company.

It is not safe now-a-days to talk, or even write, about concentration without mentioning the oil process. I do not think the sponsors of that process claim that it is preferable to water for coarse silver lead concentration. I am, however, inclined to believe, from the rough experiments made at the Highland concentrator, that with many ores there would be a very considerable saving effected by treating the tailings from fine jigs and Wilfleys or vanners by the oil process. I note that it is claimed that the process is quite cleanly. I can only say that our experiments were decidedly dirty.

I wish to acknowledge my indebtedness to Mr. Norman Carmichael, my assistant, for the very careful manner in which he has prepared the drawings to illustrate this paper.

### Gold Dredges—Their Construction and Manipulation.\*

By DAVID K. BLAIR, Consulting Dredging Engineer.

[Continued from the November issue of THE REVIEW]

For a "paddock" dredge the ladder should project well in front of the bows for the purpose of breaking down the ground in front of her, and also permit her to work into the corners of the paddock with greater ease. If the ladder does not project, it is impossible for a dredge to cut her own flotation. When dredging is to be stopped for a time, say from Saturday night to Monday morning, always lift up the ladder. If left on the bottom, especially in a running river, it silts up, that is, the drift fills up all its interstices and practically cements the lower end of the ladder solid into the bottom, and it is a very serious job to get it up again. The mishap is the result of one of two causes, namely, carelessness or stupidity, and the average gold dredge carries a fair supply of each of those commodities.

When dredging into high banks (fifteen to forty feet) or terraces of stiff wash whose angle of repose is practically vertical, and it is found necessary to undermine with the buckets extensively to get the face to fall in at all, the greatest skill and judgment must be exercised, and the face should not under any circumstances be permitted to overhang, but a Worthington, Blake, or other form of pressure pumps should form part of the dredge's equipment, and a hose and nozzle connected thereto for the softening and breaking down the face and preventing heavy falls taking place. A heavy fall of the face, besides menacing the safety of the whole dredge, may completely bury the ladder under many tons of material, with a result similar to that mentioned in cementing in the ladder. When a fall occurs get up the ladder as quickly as possible before the material sets solid around it. On the high banks about Alexandria, in New Zealand, this class of accident is of frequent occurrence.

The tumblers are one of the most important details of the dredge's structure. The top tumbler has been very lavishly treated by designers, and I believe no individual part of the dredge has received more attention at their hands, and every dredging engineer has some particular pattern for which he claims that it exceeds in virtues all others. I am of the opinion that, after all, the solid cast steel square top tumbler of the box pattern eclipses them all for simplicity and general utility. The term solid is used (for it is not really solid but cored out) merely to distinguish it from those with removable and renewable steel angles, plates or cast steel dove-tailed in corners,

all of which give more or less trouble. Harbour dredges almost invariably adopt the solid steel top tumbler of square or hexagonal form; gold dredges the four-sided top tumbler.

The duty of a top tumbler is to turn or drive the buckets, and in doing this it also tumbles them upside down and empties them (hence the name). The top tumbler is keyed securely to the same shaft as the main spur wheel.

The bottom tumbler is fitted between the jaws provided for it at the lower end of the ladder and is really only a roller being dragged round by the buckets, or we might call it a tool holder, for it maintains the buckets at the proper angle for cutting.

It is customary in gold dredges to make the bottom tumbler pentagonal in form and of solid cast steel, that is, without renewable parts. It either, as before stated, revolves on a stationary shaft or is keyed to the shaft and revolves in bearings provided for it on the cheeks of the ladder. Both types are in general use. It is advisable to have big flanges on the bottom tumbler to keep the bucket belt on. Steel tines or cutters have been fitted into the flanges of the bottom tumblers for the purpose of breaking down the wash and assisting and relieving the buckets of some of their work. The flange of the bottom tumbler, with its tines acting like a circular saw, cuts drafts or chambers in the face, the lips of the bucket in turn cutting the intervening block of wash out. It has not, however, been considered worthy of general adoption by dredging men. The duties of the bottom tumbler are of a very severe nature, being constantly associated with sand, gravel, and water, and revolving in this solution it wears away more or less rapidly according to the hardness of the material used in its manufacture.

The average life of a good cast-iron bottom tumbler in constant work is about twelve months; a cast steel one may last twice this period.

A common accident on a gold dredge is getting off the tumbler, that is, the bucket belt riding on to and over the projecting flange of the bottom tumbler. The cause is as a rule careless winching, or running with the bucket belt too slack. Sometimes, however, the design of the bottom tumbler is at fault, and very often a big projecting stone or log easily pushes the bucket belt off unless great caution is exercised. It is treated as an accident of little importance, and with a main engine capable of being reversed, (and they all should be), the two men on shift can generally get it on again in about an hour. The first step in the operation is to get the ladder up to the deck level. If a big snag or stone has become jammed among the tumbler, belt and hangers, and the ladder is one with a short overhang, or as in a river dredge, no overhang at all, it is not an easy matter to get the ladder up. After the ladder is up, short stiff billets of wood are put under the belt on the upper side, the engine is reversed so that the buckets run backwards, and the belt is run on the same way as an ordinary belt is run on to a pulley. It is sometimes possible to get a certain amount of assistance with lines led to the surging drum of the steam winch, or tackles from the gantry. With care in a well designed dredge this accident should be a rare one. Off the top tumbler is an almost unheard of accident.

The centrifugal pump is the type of pump in universal use for lifting the water for gold washing purposes. It is about the only part of the machinery of a gold dredge that is ever placed below the deck, and in my opinion, below the water line is the proper place for it. Occasionally the air and feed pumps and the electric lighting plant are below, but it is exceptional.

We have dealt with the dredge proper; it now remains to describe the gold-saving appliances employed and the methods of disposing of the tailings.

In early dredges the designers followed in the footsteps of the

\*Paper read before the New South Wales Chamber of Mines.



old diggers and simply discharged their spoil into the primitive "sluice box," with its pitched bottom, or into one fitted with "grizzlies" perforated bottoms and mats, venetian ripples, or some of the various patterns in use in the early days, according to the taste of those in charge. These old sluice-box dredges never got any phenomenal returns, notwithstanding the much vaunted perfection of the sluice-box as a gold-saving appliance.

Mr. Charles McQueen, of the now defunct firm of Kincaid, McQueen & Co., of Dunedin, N.Z. (with whom I had the honour of serving my apprenticeship) saw that the sluice-box could be improved upon, and introduced the revolving screen with the matted tables and ripples underneath.

The Araluen Central Dredge (a sluice-box dredge) in this State holds the record for Australia, and its success is attributed to the sluice-box rather than to the richness of the claim itself, and as a sequence the screens and tables are condemned.

On the Molyneux, where there is no necessity whatever for using an elevator, where the current itself carries the tailings far astern, where the sluice-box would be the cheapest gold-saving appliance possible to instal, and when installed would cost less for upkeep, in fact an ideal place for a sluice-box dredge; yet in the face of all these seeming advantages there has not for the past six years or more been a single sluice-box dredge constructed for the Molyneux or its main tributaries, the Kwaru and Clutha, and now there only remain on the river a few old derelicts to represent this style of dredge. Yet in this State there is a growing tendency among the amateur class of dredging men, or those whose experience dates from, or after, the inception of the industry here (three years at the most), to adopt what authorities in New Zealand years ago have discarded, namely, the sluice-box. In Victoria, to the best of my knowledge, no sluice-box dredge exists.

The "Lady Ranfurly" (Electric No. 3) with her magnificent return of 1234 ozs. for a week's work, the "Hartley and Riley" (1187 ozs.), "Meg and Annie," "Royal Maori," "Magnetic," "Cromwell," "Central Electric," "Alpine," "Vincent," "Perseverance No. 2," "Matau," "Unity," "Earnsclough No. 1," "Earnsclough No. 2," "Enterprise," "Ngapara No. 1," "Dunstan Lead," "Golden Beach," "Moa," "Manuerikia," "Golden River," "Fourteen Mile," "Golden Gate," etc., etc., are all Molyneux (or Kwaru) dredges, whose record returns range from close upon 100 ozs. to 1234 ozs. per week, and they are all dredges fitted with screens and tables; and there are others on the West Coast of New Zealand, such as the "Grey River," "Pactolus," "Nelson Creek," etc., with records from 100 ozs. to over 300 ozs. per week.

Sluice-box dredges in the past actually worked in some instances on the same claims as some of the above, but did nothing startling in the way of returns. Certainly they were small plants compared with those just mentioned, but they were quite big enough for experimental purposes, and their owners, when replacing them with larger and more powerful plants, were quite satisfied with the experience they had gained with the smaller ones not to adopt the sluice-box type in the larger ones.

In paddock dredging the sluice-box type of dredge can only be used in comparatively low lying and shallow ground, and only very low banks can be worked. So far, no one has devised any means of elevating the tailings from the sluice-box dredge and thereby permit her to work into the banks or terraces, but the writer does not see any very serious engineering difficulties in the way that could not be surmounted if it were found necessary to do it.

The screen, briefly, is a large revolving cylinder, perforated in such a way that the wash is distributed as evenly as possible over the matted tables on top of which it revolves. The size of the holes in the screen varies from  $\frac{1}{4}$  to  $\frac{3}{8}$  of an inch in diameter at the top end of

the screen, gradually increasing in size towards the lower end of the screen, where the maximum size in some dredges is as much as one inch in diameter. The nature and composition of the wash determines the correct size and number of the holes required. Extending down the centre of the screen, and as close as possible to the upper portion of the periphery as conditions will permit, is the sparge pipe. The sparge pipe is perforated on its lower side its entire length with several rows of holes. These holes, as a rule, are given an excess of area far above any likely requirements to enable the play of water on the wash to be perfectly regulated and controlled, and this is done by inserting wooden plugs in the holes not required, until the desired play of the water on the wash, in the screen and on the tables is attained. The water from the centrifugal pump is discharged into the sparge pipe and descends in a heavy shower on the wash within the screen, which is being kept constantly turned over and over as well as pushed along (or retarded in some cases) by the motion of the screen. Anything smaller than the holes drops through them on to the ripples and mats, anything larger goes through the screen into the stone shoot; or if an elevating dredge up the elevator, in each case arriving ultimately on the heap of tailings astern.

Screens are driven either by spur or friction gear.

Some dredges have double tables, that is, the screen is situated in the fore and aft centre line of the dredge, and the tables trend to either side; in others the tables trend to one side only, so the screen in this latter instance is at the head of the tables. Practice has proved that double tables do not act as well as the single, the play of the water on them cannot be controlled so well, and there are other defects. To overcome these defects twin screens were introduced, that is, two smaller screens side by side, each with its own independent tables; but even this system has not been followed up, and those initiating it have discarded them, and the conclusion arrived at is that one large long screen and single tables are the most efficient combination, and all those New Zealand record breakers before mentioned, with the exception of the "Golden Beach" and "Earnsclough No. 2," are dredges with single screens and single tables.

In my opinion the screen is an ideal appliance for treating wash. The strong aversion to the screen by the old digger element is that it will not save nuggets, and because there happened to be found in the early days about Braidwood and the Upper Macquarie districts a few "specks" worth about £5,000 to £10,000 each, and anticipating an epidemic of these to occur again at any moment, they think it necessary to design the gold-saving appliances solely on the off chance of getting, say, a 20 oz. "speck." The small, light, flaky, dusty, shotty, etc., gold, which constitutes our present returns, goes for nothing in their endeavours to save the nuggets. The "Kiandra" (a sluice-box dredge) got a six ounce nugget a few weeks ago, and this strengthened the sluice-box cause considerably, but I think you could safely risk a ten to one bet that the "Kiandra" or any other dredge in this State does not get another of the same size, or larger, for the next twelve months.

In conclusion, I think that the dredging companies in this State in discarding the screen and tables and reverting to the sluice-box are taking a retrograde step, notwithstanding the fact that four of the most successful dredges in this State are sluice-box dredges, namely, "Araluen Central," "Jembaicumbene," "Kiandra," and "Tulloch and Hughan's"; but there is no doubt that the dredges with screens and tables would do equally well, if not better, on the claims mentioned, and the working expenses would be practically the same, but the first cost of the screen dredge would be slightly greater.

Dredge tables are generally sub-divided athwartships into three feet sections.

Where there is a probability of nugget gold some of the New Zealand dredges have fitted a nugget catcher, that is to say the stone



shoot behind the screen is fitted with ripples. The "Fourteen Mile" (N.Z.) dredge obtained a two ounce nugget by this means; but it has not been thought worth while to generally adopt it.

Time does not permit the Californian tables as applied to dredges being described in this paper. Briefly they are a combination of the sluice-box and the ordinary dredge tables.

If the claim is one where it is necessary to work into high banks an elevator will have to be provided of suitable length to stack efficiently the material from the face dredged.

Ground stacks differently according to its composition, but for a general approximate it may be assumed that it stacks thirty three per cent. higher when elevated than it did when in the solid. Some of the large dredges working into the terraces at Alexandra, New Zealand ("Dunstan Lead," "Glasgow," etc.,) have elevators from eighty to one hundred and twenty feet long, and when loaded with tailings weigh over sixty tons. Large elevators are most expensive to construct and maintain, and entail also the construction of a very large hull to carry the immense weight with its leverage, etc., and extra engine power to drive them.

Mr. Walter Peck, dredging engineer, of Dunedin, however, has come to our assistance with a most ingenious contrivance, which in many instances will completely supersede the ponderous "jib type" elevator we see projecting over the sterns of a number of the modern dredges, besides reducing the size and cost of the hulls about one-half.

The "Ngapara No. 1," a small but very successful privately-owned dredge at Alexandra, in New Zealand, was the first to adopt "Peck's Patent Centrifugal Elevator" which consists of a cast steel drum with its surface shaped so as to act as beaters or impact plates to the tailings falling upon it from the stone shoot. The drum is designed to revolve at a speed of about two hundred and forty revolutions per minute. The diameter of the drum may be anything from three to five or six feet, according as the height to which it is desired to stack the tailings, may vary from twenty-five to eighty or one hundred feet. The beating surfaces of the drum are faced with small renewable strips of manganese steel which are readily renewed and form the only part subject to wear and tear. The "Ngapara No. 1" found the cost of renewing the beaters did not exceed £1 a month, and the elevator could stack ordinary tailings to a height of thirty-five feet, and sand to a height of twenty-five feet, though their elevating drum only measured thirty-eight inches in diameter by twenty inches wide. The "Glasgow" dredge at once discarded its eighty feet elevator and fitted one of Peck's, and their example has been followed by the "Island Block Company," and "Sandy Point" and several others during the last few months.

The credit of applying the elevator to gold dredges rests with Mr. W. H. Cutten, dredging engineer of Dunedin, who designed and fitted to the "Enterprise" dredge, Alexandra, the first serviceable dredge elevator, which turned out a great success. There is not the slightest doubt that Mr. Cutten's idea advanced the dredging industry considerably. Most of the elevators at present in use are modifications of Mr. Cutten's original design.

All the leading points in the details of the construction have now been touched upon, and it only remains to give a general idea of the manipulation of the assembled parts—the "gold dredge" herself and the general principles on which she is worked on her claim.

To commence with, a dredge ought to be built on the lower pegs of her claim whenever it is possible to do so. Sometimes it is impossible to get solid ground at the spot, or it may be that the ground is too irregular; or the only suitable site for building may be on the top of the high banks where it would be an impossibility to launch from; or it may be submerged by floods. A large number of dredges in this State were built under flood mark, and I only know of two that were caught. Building under flood water mark is a very risky undertaking,

even with the dry season before you; yet there are claims where it has to be done; for instance, in low lying river banks or flats which the river when in flood submerges, say for several hundred yards back; to build above the flood mark in a case of this kind would mean launching or skidding the dredge several hundred yards, a most expensive operation. It is very often a matter of supreme importance that the dredge should start on a spot where a rich patch of gold is known to exist, whether it be above or below flood water mark, or at the top, middle, or the bottom of the claim.

The reason for building at the lower end of the claim, whether it be a river or flat, is this: A dredge always if possible works up the stream (in the Molyneux she could hardly do anything else), her tailings are then always on the down stream side (that is behind her), and the dredge practically constructs her own dam and brings or banks up the water in front of her with her own tailings as she goes along, if it is found necessary to do so; if she were working down stream, and the ground shallow, it would be necessary to keep building dams ahead of her, a very costly operation. Another point, in rivers like we have in Australia, when working up stream your tailings fall on the down stream side of the dredge, and if a flood comes it washes them further away—you have seen the last of them; but if you are working down stream the tailings are all on the up stream side of the dredge, and the first flood that comes along generally washes them over the top of the dredge and fills up the paddock, and when it subsides you usually find the dredge left high and dry, and almost invariably in a twisted condition.

It might be argued that a flood generally fills up a dredge's paddock in any case; so it does, but when filling it up it might as well fill it up with untreated material as with tailings.

On a flat where you do not depend upon damming a river, (as in the case of the "Ovens Valley Co's" claim in Victoria) it is immaterial where you start, provided it is a point that commands the whole claim on the proposed working scheme.

A gold dredge is manipulated by six steel ropes, which are led on to the particular barrels allotted to them in the winch before mentioned, namely:—Head-line, port bow-line, starboard bow-line, port stern or quarter-line, starboard stern or quarter-line, and ladder-line. All these with the exception of the ladder-line are secured to trees or stones, if they are procurable in the correct position, if not a form of anchor, called in dredging parlance a "backer" or "toggle," is used. These are simply logs of hardwood, eight to ten feet long, and from six to ten inches in diameter. The steel lines are secured round the middle of these logs directly or with a chain sling, or steel rope strop. A T-shaped hole is dug in the ground, in the required position, varying in depth from two to six feet according to the holding capabilities of the ground. The backer is dropped into this hole and buried up; the log forming the head of the T, and the chain sling, steel rope strop (or steel line) the vertical portion of the T. This form of anchor if properly put in in hard ground will hold almost anything; but if submerged by flood water, often washes out. A dredge master always tries, if it can be done at all, to get his head-line round a good solid rock or a strongly rooted tree.

The head-line is the line that holds the dredge up to her cut and resists the back thrust and surge of the dredge as the buckets at their work strike and leave the face. It is the heaviest line on the dredge, and very stiff in construction compared to the other lines.

In the actual working it is advantageous to use as long a head-line as possible, for the head-line is the radius of the arc that is formed by the dredge when at work on the face of her paddock; and as it is desirable to keep the face as straight as possible, a short head-line puts too much convexity in the face, and also puts a very heavy strain on the side-lines (and the winch generally) when the dredge is in the corners, making it a difficult matter to retain the desired width of face.



Where the distribution of gold is pretty equal over the river or flat to be dredged, the wider the face the better, as taking out the corners occupies considerably more time for the work done than straight dredging, and loss of time means less material treated and a correspondingly less quantity of gold won. A wide face means a long head-line, but in low lying rough country the length of head-line is limited. At Waipori, in New Zealand, where the dredges work with faces several hundred yards wide, a single head-line would require to be so long that it would be practically unworkable. The system adopted there is to have several head-lines and use one for a certain distance, then change on to another; this is found more expeditious though more expensive than using one line and shifting it on to different backers arranged at the required intervals across the face.

Opening out is the term applied to the initial operations of the dredge in cutting out the width of the face and size of paddock required. A paddock dredge generally starts in a square excavation of a size sufficiently large to allow her to turn completely round in it (that is its size is fifteen per cent. or twenty per cent. more in length than the extreme length of the dredge itself), and takes cut after cut across the side of the paddock destined to be the face. On each successive cut she turns at an angle of about forty-five degrees, and cuts directly into the corners of the face, as far as she can, each time thereby widening the face and making her paddock wider until the desired width of face is obtained.

The building site should be selected with a view of allowing the dredge to open out on both corners. The duration of opening out operations is from a fortnight to a month. At the end of these periods it is assumed that the dredge is in a thoroughly efficient position to deal with the ground ahead, and that the owners may expect steady work and regular gold returns. In opening out operations gold getting and saving are only secondary considerations, the first being to get a proper working face and paddock formed.

The side-lines are arranged to either hold the dredge steady or pull her into any required position laterally, and are secured to backers in suitable positions to accomplish this end. The side-lines have to be long enough to at least reach the full width of the paddock; in construction they are much lighter and more flexible than the head-line.

The ladder-line lowers or lifts the ladder as required. In construction it is lighter than the head-line and much more flexible than the side-lines on account of the number of sheaves it has to run over.

In working a gold dredge every effort should be used to keep the ladder on the bottom (that is the gold-carrying bottom) all the time, even when pulling forward on the head-line for a new cut; this cannot, however, always be done, and in very tight ground (like the Macquarie) that will not fall in, the ladder has to be lifted to the surface of the water, or surface of the cut, every time before pulling over the dredge laterally on the cut, to feed the buckets, and the face from the surface (of the water) has to be cut down to the bottom by the buckets themselves; or it has to be worked by a series of light horizontal cuts across the face until the required bottom is reached. The portion standing above water is broken down with a water jet, or jumped down with crow-bars, or a shot is put in to loosen it.

All dredge winches should be so designed that the ladder-line can be manipulated without disengaging the side line clutches. This is a very important point in ground liable to falls, the loss of time in releasing the side-line clutches being a serious consideration in event of a heavy fall of material coming on the ladder. In very rough ground in which the dredge surges about a lot the trailing-lines (*i.e.* paying out lines) should be held perfectly tight with the brakes, and only eased sufficiently to permit the dredge to be pulled across the face, the necessary amount to feed the buckets. It is a most reprehensible practice to allow the dredge to surge about indiscriminately, as some winchmen are in the habit of doing. A dredge should be held as steady as pos-

sible to give the buckets, gearing and tables the best chance of performing their respective duties.

Stones up to a ton weight, or more, are lifted by the buckets and grabs of gold dredges. The method of handling the stones is to stop the bucket or grab, as the case may be, on its arrival at the deck-line, and roll off the stone on to the deck or pick it up with a small jib crane provided for the purpose and land it on the deck; it remains there until the side of the paddock is reached and it is then rolled or skidded off on to the side of the paddock, or if the ground is deep it is put at once on a small trolley and run far enough aft on the dredge to prevent it rolling back on to the face again, and dropped over the side into the bottom of the paddock. When a big stone is met with in ground with a soft bottom, the best way of getting rid of it is to dig a hole with the buckets at the side of it and let the stone drop into the hole dug.

Heavy timber is a far more difficult thing to deal with, and it is quite a common occurrence to lose days and days grappling with a big sunken log. Submerged logs have been lifted on the Ovens River, in Victoria, seventy feet long, with a mean diameter of three feet, and when lifted were found to be perfectly sound in every respect. This says a great deal for Australian hardwood, but dredging men would have much preferred, for their part, that Australia had not been so liberally endowed with good timber.

To deal with log handling would occupy more time than is at our disposal. Briefly, the log is loosened along its entire length, if it can be got at by the buckets, one end is freed and lifted up with the assistance of the powerful cranes provided in all dredges equipped for log handling. When the end of the log is raised high enough, a convenient section of it is cut off with a cross-cut saw, or axe, and rolled or dragged by bullock or horse teams out of the way of the dredge, and this process is repeated along the log until the log is entirely removed. A big log may have to be cut into several lengths before it can be removed.

Before concluding it might not be out of place to mention the name of Mr. Charles McQueen, who undoubtedly is the father of practical and profitable gold dredging. The others before him were in reality only theorists, and their schemes were very crude indeed until Mr. McQueen took up the matter and, at his own expense, went into costly experiments for the benefit of the industry as a whole; with the result that gold dredges are now treating ground in parts of New Zealand at a cost of something under three farthings per cubic yard, and the gold dredge as we see her to-day is to all intents and purposes Mr. McQueen's dredge of twenty years ago. To Mr. Chas. McQueen and a few other enterprising men in New Zealand, and to Mr. C. L. Garland, the pioneer of gold dredging in Australia, the mining industry owes a debt of gratitude, and numbers of abandoned goldfields, both here in Australia, as well as in New Zealand, have been converted into hives of industry by this simple and inexpensive process—dredging.

#### New Assay Plant of the Canadian Smelting Works.

To replace the assay office which was destroyed by fire in July last, the Canadian Smelting Works has completed at Trail, British Columbia, a new structure, which, in point of modern equipment, equals, if not surpasses, any assay office on the American continent. The purpose of the management is to keep pace with the progress and needs of the rapidly increasing resources of a new country, and to that end the assay office has been constructed and equipped to permit of the running of all classes of work that might be presented, such as coal and coke, iron and nickel ores, gold, silver, copper and lead ores and other mineral deposits, in addition to any experimental work which might be necessary in connection with the smelter and the new electrolytic lead refinery.



In the case of the Canadian Smelting Works, where the ores are so varied, coming as they do from all parts of the Province, containing anything from 200 ounces down in gold, and 5,000 ounces down in silver, from 30 per cent. down in copper and 82 per cent. down in lead, in practically every combination—and such impurities as molybdenite, arsenic, zinc and antimony—the assay office holds even a more important relation to the smelting industry than is generally the case, the great variety of ores making it necessary to analyze nearly every shipment. Such large quantities of zinc and other impurities demand the closest tab on the furnaces, roasters and every part of the works, necessarily increasing the demands on the assay office.

The new structure consists of two large brick buildings; the smaller or furnace building being built into and at right angles with the main structure, yet being entirely separated by brick walls. The main building, which is 70 x 35, contains the office, two balance rooms, an electrolytic and parting room, the chemical laboratory, bucking room, store room and basement. In the basement is the motor, which furnishes power for the mills and crushers.

Two samples of every shipment of ore are sent to the assay office, where they are placed in electrical dryers. On one the moisture is calculated and the other is pulped. The mills and crushers are all on separate foundations to prevent vibration in the building. The sample is divided into four parts, one of which goes to the mine, one is sealed and put aside for use of an umpire, the third is stored for reference and the fourth is assayed. In case of dispute, the umpire sample is sent to some assayer agreed upon by both mine and smelter, and his assay is final. All samples are taken to the pulp room, where there is a cabinet capable of holding 10,000 pulps. All the weighing of pulps for chemical, furnace and electrolytic work is done in this pulp room, which is equipped with glass-top tables, built from the ground, and carrying four chemical balances.

On one side of the pulp room is the chemical laboratory, fitted with every new labor-saving device. The chemical and H<sub>2</sub>S draft chambers, for the purpose of carrying off all acid fumes, are brick the full height of the building. The chemical hood has four electric hot plates, each 12 x 18 inches, for chemical work, with separate adjusting apparatus, so that the chemist may have any degree of heat, from 50 degrees centigrade to the melting point of tin, without the slightest inconvenience. The H<sub>2</sub>S hood has two similar electrical plates, three sulphuretted hydrogen and one dionide generator. In the laboratory there are two hot water tanks, one of which is connected with a still for distilled water, heated by electric coils and provided with syphons and rubber tubes for washing precipitates. Amongst other useful equipment are the vacuum and pressure pumps and the hot and cold water throughout.

On another side of the pulp room is the entrance to the furnace building, the walls of which are surmounted by large ventilators and skylights. The furnaces, four in number, have 23 x 17½ inch muffles, and are constructed to burn Crow's Nest coal. They have a common 40 ft. stack. The fire room is also open to the roof, and is divided from the furnace room by a brick wall. The floors are concrete, covered with quarter-inch sheet iron.

Two electrolytic plates and a hood for fumes, similar to those in the laboratory, are contained in the electrolytic parting room. The electrical equipment in this department also comprises a set of storage batteries, connected with a dynamo in the basement, which are capable of delivering a continuous current of 20 amperes at 6 volts, the distribution of which is governed by rheostats, capable of cutting the whole down to one-tenth ampere. Larger currents, up to 500 amperes, may be had direct from the dynamo, when required for experimental work.

Not the least interesting, however, is the balance room, which

contains three gold balances and one analytical balance. To insure greater accuracy, they are mounted on tables, and are so delicate as to weigh the ten-millionth part of an ounce.

The building, with its arrangement and equipment, was planned by Mr. S. G. Blaylock, assayer for the Canadian Smelting Works.

### Notes on the Training of a Colliery Manager.\*

By R. A. S. REDMAYNE.

It is interesting to compare the present status of colliery managers with the position and requirements of those in the early history of the coal trade.

In that quaint little volume—perhaps the earliest treatise on colliery management in the English language—"The Compleat Collier; or, the whole Art of Getting and Working Coal Mines, etc., as is now used in the Northern Parts, especially about Sunderland and Newcastle," by J.C., and printed by G. E. Conyers, at the Ring in Little Britain, 1708, the writer says that a "viewer should be well skilled in lining and levelling," as also in the method of "coal working," and should have a knowledge of the "nature of the coal," for, says he, "there is a very great occasion for all these qualities," and adds that "it behoves the viewer and overman to be experienced in guiding the air to good purpose, as also to order well and prudently, for Stythe, which I before spoke of, doth destroy the ignorant and unwary."

The charge of a colliery manager in those days was not an excessive one, seeing that, though he might have a number of mines under his control, in no case would any one of these extend beyond a radius of 200 yards from the shaft. His wage was correspondingly small, being 15s. to 20s. per week, or more "as he has pits to look after." Says the "Compleat Collier," "the viewer well deserves his 15s. or 16s. a week if he has care and parts."

Mr. J. B. Simpson,† writing of the term "viewer" says, "The first mention I can find of the old name is in 1356, in a lease from Bishop Hatfield to Thos. Grey, Knight; one clause of which states that the lessee had to work the mine as far as it could be wrought by five barrowmen, according to the view and oath of the chief forester, and of the viewer (spelt 'veiour')."

Coming down to a much later date, we find, in an "opinion" hitherto unpublished, written by Mr. John Buddle, senior, a viewer of great note in the latter half of the 18th century, the following definition of the duties and salaries of an agent and viewer respectively. Under the date of March 22, 1830, Messrs. Donkin & Stable write to Mr. Buddle to the effect that the owners of a "Seasale colliery, upon the Tyne, of considerable magnitude (the basis of its vend for 1828 being between 22,000 and 25,000 tons)" are about to make a change in the agency of the colliery, and are desirous of having his opinion with regard to the system which he deems most advisable to be pursued in the management of such a colliery, the number of agents he would recommend to be employed, and the duties of each, etc. Mr. Buddle answers that he is of the opinion "that the affairs of the colliery would be best conducted by one principal agent or manager, and one principal viewer, with the aid of subordinate assistants in their respective departments," the agent to have the management of the fittings (sales) and all cash transactions of the concern, purchases, etc. The viewer or manager "to have the sole management and direction of the colliery in all its several departments, embracing the machinery, etc., from

\*Abstract of paper read before the South Staffordshire and East Worcestershire Institute of Mining Engineers, on December 8th.

† "Rise and Progress of Coal Mining." An address delivered at Newcastle-on-Tyne before Students of Inst. C.E., 1896.



the hewing of the coals to their delivery into the ships." He adds at a later date—April 5th, 1830—that for an agent "a salary of £250 or £300 a year with house and fire, and a cow kept, would be fair and ample; as to the viewer, if not resident, I think a clear annual salary of £200 a year fair and reasonable, without any perquisites whatever, except his flannels."

Even so late as the year 1854, we find that the largest collieries were comparatively small affairs, the output from the largest amounting only to about some 200 to 300 tons daily, although they were equal to drawing "400 to 500 tons daily at each pit. The number of the workmen at two large pits at this period was 428 and 179 respectively, including boys. It is interesting to compare this with the establishment of a large modern colliery, and the comparison illustrates as much as anything the great extension that has taken place since the middle of the last century.

What are the qualifications demanded of the colliery manager of the present day?

It will be everywhere acknowledged that more scientific knowledge is now requisite to deal with the larger issues at stake at the present time or looming ahead of us. Briefly summarized, the necessity for this increased and increasingly higher education of our mining managers may be stated as being due to the following facts:—

1. The mines are deeper, the more easily worked seams and shallow mineral deposits are rapidly approaching exhaustion, and deeper and more difficult mining, as well as developments in engineering, has led to—

2. The introduction of more elaborate machinery, necessitating a wider knowledge of the principles underlying its construction, application and management—especially noticeable under this category is, of late years, the application of electricity to many mining operations.

3. Foreign competition, which, growing in keenness, necessitates wherever possible the introduction of labor saving appliances, as indeed of anything that tends to cheapen production.

4. Stringent State regulations, imposed in a great measure for the protection of the persons and interests of the miners.

5. The higher educational status of the mine-workers, rendering tact, discrimination, and higher mental attainments, generally necessary in those set in authority over them.

6. The great and increasing development of Colonial mining, opening out as it does, a wide field of profitable employment for highly trained mining engineers.

And under this final category it is significant that in respect to metal mining, the leading positions in South Africa, Western Australia, and other of the Australian Colonies are held not by British or Colonial trained mining men, but in the majority of instances by men trained in America.

In Britain we still produce the best colliery managers, but then our coal mines are more difficult to manage than are those of America, by reason of the greater depths and thinner seams. But even in this department of mining, we would seem to be losing our proud pre-eminence. Up to the year 1899, we held the position of being the largest producers of coal of any country in the world; but in that same year America wrested this position from us. Moreover, we are far behind our trans-atlantic rivals in the matter of cutting coal by machine, as the following figures show:—

In the year 1899 Great Britain produced by coal-cutting machines 3,538,408 tons.

In the year 1900 Great Britain produced by coal-cutting machines 3,312,000 tons.

In the year 1901 Great Britain produced by coal-cutting machines 3,044,340 tons.

Whereas in America:—

In the year 1899, 3,125 machines were in use which mined 43,963,935 short tons.

In the year 1900, 3,907 machines were in use which mined 52,784,523 short tons.

In the year 1901, 4,341 machines were in use which mined 57,843,335 short tons,

and in ten years, from 1891 to 1901, the number of machines has increased from 545 to 4,341.

It may be argued that conditions prevailing in the American coalfields are such as allow of the proportionately larger introduction of coal cutting machinery, but can it be maintained to such a relatively greater extent? It would seem, therefore, that what we might copy from the Americans in matters relating to mining, and indeed in other departments of engineering, is their readiness to adopt wherever possible labour-saving machinery.

It must not be supposed that the writer is for one moment an advocate for the adoption of American methods in their entirety, but he takes the position that we should be willing and anxious to learn what we can from anyone, more especially from our chief competitors.

There is one point in respect to the training of mining engineers in which he believes, we are in advance of the Americans, though they hold otherwise, and that is, in respect to our apprenticeship system. There is no mining apprenticeship in vogue in America, but he would ask at the same time, are we not possibly erring on the side of excess in this matter? For the five years' underground practical experience required by the Coal Mines Regulation Act of 1887, before a mining student can sit for his certificate of competency as a colliery manager, practically precludes the possibility of obtaining the scientific training so necessary at the outset of a mining engineer's career to fit him for the effective management of mines, coal and otherwise, now required.

In a conversation which the writer had with Prof. H. S. Munro, chief of the mining department, at the Columbia University, the latter emphasised three special points for mining students, placing them in the following order:—

1. Thorough ground work in the sciences allied to mining, mathematics, physics, chemistry, and geology.

2. Thorough training in the special department of applied science which the student intends adopting as a career.

3. Competency of the student to commence earning a livelihood at once on his leaving the university.

So much for America. What is of greater importance to us is the question: What is being done in the way of higher education for the mining men of Britain? For, though in pure science we are still pre-eminent, it seems to the writer there is this great difference: The American engineers are submitted to greater thoroughness in technical training than are our men. Better facilities, in this respect, are placed before them, and realizing the paramount importance of such training, they take greater advantage of it than seems to be deemed necessary in this country. Technical education is held in higher regard by the owners of mines and other industrial concerns in America, than is yet the case in Great Britain. Anyone who has read the accounts of what is done and provided in the U.S.A., and contrasts the magnificent educational apparatus of their universities with the scanty system, or want of system in this respect in this country, will no longer be at a loss to understand one reason why the British mining engineer, who seeks employment in our Colonial mining regions, is handicapped in the race for supremacy.

At Birmingham, at any rate, it is hoped that this deficiency will be remedied, and the writer believes that it will be so, with the assistance of the mining men of the Midlands. Much good work has been



and is being accomplished by the County Council lectures in mining in the Midlands, which will undoubtedly be the means of inducing many of the young men who benefit by this instruction to proceed to the university with the view of further advancement in this department of study.

As it is, courses of study have been arranged, and are already being conducted for practising and consultative mining engineers, colliery managers, and managers of metal mines, teachers of mining, and mine surveyors. The complete course including instructions in the following subjects:—

1. Mathematics (including algebra, trigonometry & geometry).
2. Inorganic chemistry with laboratory practice.
3. Geology and mineralogy.
4. Physics and laboratory practice.
5. Mechanical and electrical engineering.
6. Coal and metal mining.
7. Metallurgy and assaying, in so far as applied to the treatment of ores only, and the analysis of fuel.

Besides the indoor work, there will be frequent visits to the mines of the neighbourhood, and occasional surveying classes are being held out of doors, in which the students practise what they have learned theoretically; and a month or five weeks will be devoted by the students each year in company with the Professor, to the inspection and study of some group of mines in Britain, or it may be abroad, which will constitute the summer mining school.

#### Mineral Shipments Over the Quebec Central in 1902.

By courtesy of the accountant of the Quebec Central Railway we have been favored with the following returns of the minerals shipped over the Quebec Central Railway in 1902:—Asbestos 25,025 tons (from Coleraine 274,680 lbs., Black Lake 961,020 lbs., Thetford Mines 564,480 lbs.); asbestic 5,445 tons; chromite 900 tons; brick 9,798 tons; lime 9,102 tons; flagstone 1,401 tons; granite 335 tons; cement 20 tons.

#### Dominion Iron and Steel Company, Limited.

The following official returns of the output of the Dominion Iron and Steel Co. during the year ended 31st December will be of interest:—

| Receipts of Ore—                              | Tons.   |
|-----------------------------------------------|---------|
| Iron ore mined by Company in Newfoundland.... | 298,654 |
| Iron ore imported from Spain.....             | 27,499  |
| “ “ United States.....                        | 24,978  |
| “ “ Sweden.....                               | 9,887   |
| “ “ Cuba.....                                 | 3,102   |
| Pyrites “ Newfoundland.....                   | 279     |
| Limestone quarried by Company.....            | 204,040 |
| Products—                                     |         |
| Coke.....                                     | 338,230 |
| Pig iron.....                                 | 191,259 |
| Steel billets and slabs.....                  | 86,424  |

#### Cape Breton Coal Company.

The coal disposals of this company's New Campbellton colliery in 1902 were:—

|                                         |        |
|-----------------------------------------|--------|
| To Quebec.....                          | 1,718  |
| Newfoundland.....                       | 2,134  |
| Nova Scotia.....                        | 3,719  |
| P. E. Island.....                       | 504    |
| New Brunswick.....                      | 126    |
| Other countries.....                    | 1,554  |
| Colliery consumption and employees..... | 3,083  |
| Total.....                              | 12,838 |

#### Gold Bullion Handled by the New Dominion Assay Office at Vancouver, B.C.

Dr. Haanel in his report to the Minister of the Interior for the year ended 30th June last gives the following returns of the bullion deposited with the Dominion Assay Office at Vancouver, B.C.:—

| From                   | No. of Deposits. | Weights. Oz. dec. | Value. \$    |
|------------------------|------------------|-------------------|--------------|
| Yukon.....             | 266              | 50,578.36         | 824,125 89   |
| British Columbia.....  | 366              | 16,469.55         | 284,401 12   |
| North-West Territories | 12               | 218.04            | 3,990 71     |
| Ontario.....           | 24               | 2,597.31          | 39,368.60    |
| Unclassified.....      | 3                | 62.41             | 1,128 18     |
| Totals.....            | 671              | 69,925.67         | 1,153,014 50 |

## NEW COMPANIES.

#### ONTARIO.

**Dominion Oil Co., Limited.**—Incorporated 11th Dec., 1902. Authorized capital, \$850,000; in shares of \$1.00 each. Head office: Chatham, Ont.

**Saugeen Oil Co., Limited.**—Incorporated 11th Dec., 1902. Authorized capital, \$10,000; in shares of \$10.00 each. Head office: Walkerton, Ont.

**Summit Lake Gold Mining Co., of Ontario, Limited.**—Incorporated 19th Dec., 1902. Authorized capital, \$100,000. A. F. MacLaren, Stratford, Ont., Attorney.

**Hutton Mining Co.**—Incorporated 14th January, 1903. Authorized capital, \$100,000; in shares of \$10.00 each. Head office: Sault Ste. Marie, Ont.

**Moose Mountain Mining Company.**—This company, capitalized at \$1,000,000, and the Hutton Mining Company, with the same capital stock, have been organized to develop the iron range north of Sudbury, discovered some time ago by Railroad Commissioner Chase S. Osborn. The incorporators of both of the companies are Chase S. Osborn and Otto Fowle, of the Soo, Mich., and Messrs. Hearst, McKay and Darling, of the Soo, Ont. The companies control 5 miles of the range along what is known as the Moose Mountains. The iron formation is reported to extend 30 or 40 miles. The principal discoveries of apparent greatest value have been along the west branch of the Vermillion River, prolonging northwest and southwest into the township of Hutton in the District of Nipissing. To the northwest the range runs into an unsurveyed territory of the Algoma District. The ore is a hard magnetite, reported to run from 60 to 67 per cent metallic iron, with much low enough in phosphorus to be of Bessemer grade. The ore is without a trace of titanium. The work done up to the present time has consisted of locating and securing titles to the properties, road building, camp building, diamond drilling, trenching, cross-cutting and test pitting. In this sort of work alone there has been expended over \$100,000.

## COMPANY NOTES.

**Slough Creek.**—Cable received from the mine manager, dated Barker-ville, B.C., 12th inst.:—“Now working south drift. We are driving 1 ft. per day. Present appearances show considerable signs of improving. Water about the same. Length of No. 1 crosscut to the east is 26 ft.; No. 2 30 ft.; No. 3 20 ft. South drift, 140 ft.—Splendid wash.”

**Ymir.**—Cablegram from the company's representative at Nelson, British Columbia:—“During last month 50 stamps ran 650 hours (27 days) Estimated profit on operating, \$7,671 (£1,580). This is after deducting development \$2,900 (£600) and repairs \$1,550 (£320).”

**Mica Boiler Covering Company.**—Lien registered January 2, for £15,000 debenture stock. Trustees: Mr. P. A. Makins, 12, Stanford Road, Kensington, and Mr. C. R. Tritton, banker, 1, Pall Mall East, S.W., charged on the undertaking, and all the property and assets, including the uncalled capital.

**London and British Columbia Goldfields.**—In a circular to the shareholders the directors state that important negotiations for improving the position of the company are now in progress, in connection with which the chairman has recently visited the United States and Montreal. As it would not be in the interests of the company to hold the general meeting until these negotiations have reached a further stage, it has been decided to postpone the holding of the annual general meeting until as early a date as possible.

**Whitewater Mines.**—The secretary writes that it has been deemed advisable to make up the company's accounts to the end of last year, and to submit them at a general meeting, to be held as soon as possible after that date. Work at the mine continued until September last, when it became necessary to cease all operations owing to the stoping having overtaken the development. Strong efforts are now being made to obtain legislation for the improvement of the local market conditions, which, if successful, will considerably benefit the company's position. The chairman, Mr. H. W. Forster, has resigned on account of his recent Government appointment.

**The New Vancouver Coal Mining and Land Co.**—will shortly pass out of existence, the property being sold through its agents, Messrs Rosenfeld, of San Francisco. We should not be surprised to hear that the Dunsmuir interests are the real purchasers. The Board was armed with an overwhelming number of proxies at the meeting on Tuesday, which the Chairman



did not scruple to use, but some of the questions of the shareholders—to whom he gave scant courtesy—appeared very pertinent. So anxious are the directors to rid themselves of the property—and receive a solatium of £5,000 for loss of office—that they have agreed to take their agents' promissory notes for £50,000, but the mines are to be handed over without reservation on receipt of £60,000, or a little over half of the purchase price. Some of the more businesslike shareholders suggested that the company should retain some hold on their property until they had been paid in full—a suggestion which the Board refused to consider. The American agents who guarantee the balance of the purchase price are to receive an unnamed sum for guaranteeing this payment, and an additional £2,000 for relieving the company from an investment of £10,000 in the shares of the purchasing company. The superintendent receives £10,000; the secretary, £3,000; his assistant, £1,000, with other bonuses to various officials. The shareholders are promised a return of 20s. per share, with a possible addition of 2s. per share. The company, by the way, has accumulated cash assets of £100,000, and its lands and collieries on Vancouver Island are of more value to-day than ever before, so the anxiety which the directors display to get rid of their property is difficult to understand.

**Snowshoe Gold and Copper Mines.**—The report of the Snowshoe Gold and Copper Mines, from the inception of the company to 30th September last, which was submitted at the meeting on Wednesday last, states that development work has been vigorously prosecuted during the period named, and the mine is rapidly approaching the time when it will be capable of shipping to the local smelters 500 or 600 tons of ore per day. The plant and equipment includes boilers, compressor engines, hoist, pumps, and other machinery necessary to the proper working of the mine. The new main three-compartment shaft has been completed to a depth of over 300 ft. and an electric hoist is being installed. A great deal of underground work has been carried out, and large areas of the surface have been stripped, disclosing very extensive ore bodies. In addition to the old buildings, a number of new ones have been erected, including a new office, boiler and engine house, boarding house, bunk house, and residences for the accommodation of the staff and employees at the mine. During the period covered by the accounts 9,000 tons of ore have been sent to the local smelters. Most of this has been in the nature of experimental shipments from different parts of the mine, in order to prove the value of the large bodies of ore exposed, and the result has been satisfactory. Shipments of from 150 to 200 tons of ore per day are at present being made, which yield a substantial profit, so that earnings are now being put back into the mine. Arrangements have already been made with smelters in the district to take the ore as they can handle it, to the extent of 400 to 500 tons per day. One of the companies is enlarging its smelter capacity, and will then be able to deal with a larger tonnage of this company's ore, as well as with ores from other mines. The profit to be derived from these shipments would be considerably enhanced had the company its own smelter. The main Phoenix branch of the Canadian Pacific Railway crosses the Snowshoe mine, and the railway company has put in additional sidings there in order to provide better facilities for handling our

ore. There is good reason to believe that the Great Northern Railway—an American line—will next year cross the company's property, as their engineers have already surveyed a branch to the Snowshoe.

The managing director visited the property in 1901, and again in 1902, on each occasion spending some months there in consultation with the local officials as to the best course to be adopted in carrying on the development of the mine. He has taken every opportunity for discussing with the Government and railway officials and with the owners of neighboring properties the numerous questions affecting the company's interests. During this year two of the directors, Mr. Waterlow and Dr. Lewis Jones, visited the Snowshoe mine, and spent several weeks there in thoroughly investigating the whole situation on the spot, and were able to form a very favourable opinion of the progress of the mine since the date of their former visit in 1900.

## MOLYBDENITE

FOR LEASE OR WORKING BOND.

A Molybdenite prospect for lease or working bond. C.P.R. runs through property. Unlimited water power.

APPLY TO

**T. L. STAMFORD,**

**Nelson, B.C.**

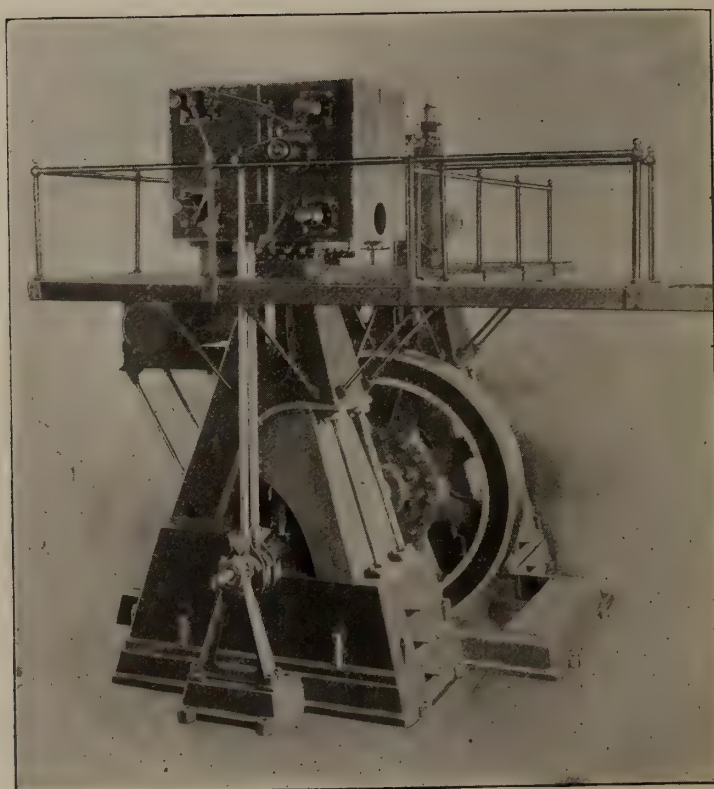
P. O. Box 86.

## OPEN FOR ENGAGEMENT

**Mechanical and Civil Engineer**

**T**ECHNICAL graduate. Five years' experience in railroad and mining work. Well posted in machine shop practice, mine equipment, cable haulage, surface mining, deep water, ore docks and fast loading devices. Desires a change. Open for engagement Dec. 1st. Address IRON ORE, c/o *Canadian Mining Review*.

# THE LAURIE ENGINE COMPANY MONTREAL CANADA



500 H.P. Laurie Vertical Cross Compound Electrical Engine.

**LAURIE CORLISS ENGINES ARE THE STANDARD FOR ALL POWER PURPOSES**



## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

# 60% PER ANNUM GUARANTEED

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT READY FOR THE MILL and the Hoodlum Claim, which adjoins the Old Victor Mine, yet to figure on.

A 200-TON PER DAY PLANT CONTRACTED FOR and will be in full operation not later than April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.

Do not fail to investigate this proposition, for the more you investigate the more stock you will want. Write for prospectus.

W. H. BALDWIN & CO., Brokers and Financial Agents 49-50-51-52 VOLCKERT BLDG., ALBANY, N. Y.

REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company, Los Angeles, Cal.; any mining journal of the state or prominent mining men.

## Bartlett Concentrating Table.

Bids for Manufacture in Canada.

The undersigned is prepared to grant licenses for the manufacture and sale of the

**BARTLETT CONCENTRATING TABLE,**

under Canadian patents No. 66546.

**F. L. BARTLETT,**

721 Seventeenth St.

DENVER, Col.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

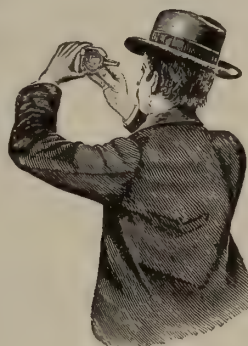
...APPLY TO...

**WETHERILL SEPARATING CO.,** 52 Broadway, New York

Manufacturing Agents for Canada, **ROBERT GARDNER & SON,** Montreal, P.Q.

## Brunton's Patent Pocket Transit

For Surface or Underground Surveys



THE accompanying illustration shows an operator taking vertical angles with the Brunton Patent Pocket Transit.

It is the most accurate and reliable pocket instrument made for preliminary surveys of every description.

Case of aluminum  $2\frac{3}{4}$  by  $2\frac{3}{4}$  by 1 inches; weight 8 ounces.

Nearly 1,000 in use by prominent mining engineers, mine managers, civil engineers and geologists everywhere.

May be purchased from any reliable supply house or direct from the sole manufacturers . . . . .

## Wm. Ainsworth & Sons,

Sole Manufacturers

Denver, Colo., U. S. A.

Send for Catalogue B-5 for full particulars.

# BRIQUETTING MACHINERY FOR SMELTERS AND BLAST FURNACES....

BRIQUETTE your Flue Dust, Fine Ores, Calcines, Concentrates, Slimes and other Mineral Fines

INCREASES THE CAPACITY OF THE FURNACE FROM 10 TO 25 PER CENT.

Our Improved **WHITE MINERAL PRESS** the only successful machine for the purpose.

Adopted by most all the Prominent Smelters in the United States.

Used by several Large Steel Works for briquetting Common Iron Flue Dust.

Sent on Trial and Satisfaction Guaranteed.

## CHISHOLM, BOYD & WHITE CO.

CATALOGUE MAILED ON REQUEST

OFFICE AND WORKS: 5700 Wallace St.

CHICAGO, ILL., U. S. A.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSSEN & CO.**

MONTREAL

Obtain our Prices.

# MINE RAILS



## ADVERTISING PAYS.

Montreal, 21st February, 1902.

The Canadian Mining Review,  
Ottawa.

We have been advertising in the Canadian Mining Review for some sixteen years, and as extensive manufacturers of mining machinery in Canada we have great pleasure in stating that we consider that the money spent in reaching the public through your columns has paid us an hundred fold. We consider it, without exception, the best medium to reach the mining, engineering and investing public in the Dominion of Canada, not taking into consideration its foreign circulation. Our continued patronage will serve as substantiating the above assertions.

We are

Yours faithfully,

THE JAMES COOPER MFG. CO.



# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST MANUFACTURERS MINERS SAFETY LAMPS OF ALL KINDS

DAVIS'S PATENT ELECTRICALLY  
LIT LAMP TO BURN SPIRITS.



DAVIS'S "A" DEPUTY'S FIREBOSS'S  
AND SHOT-FIRER'S LAMP.  
DAVIS'S "A" DEPUTY'S FIREBOSS'S  
AND SHOT-FIRER'S LAMP.  
DAVIS'S "A" DEPUTY'S FIREBOSS'S  
AND SHOT-FIRER'S LAMP.



DAVIS'S "A" DEPUTY'S FIREBOSS'S  
AND SHOT-FIRER'S LAMP.

Stock at Montreal.

Sole Representative  
for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building  
MONTREAL.

Send for Catalogue and Prices.

## A. LESCHEN & SONS ROPE CO.

SOLE MANUFACTURERS OF

Patent Flattened  
Strand Wire Rope



Trade Mark Registered

REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

LESCHEN'S Aerial Wire Rope TRAMWAYS

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

BRANCHES: New York, Chicago, San Francisco.

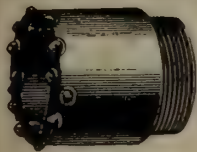
## BERNARD BANDLER

IMPORTER OF

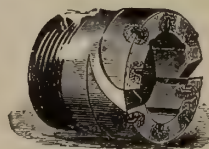
## CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



GOODS SENT SUBJECT TO APPROVAL



COMBINED THEODOLITE AND  
MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine  
Staff, 6 feet, closing to  
20 inches, very port-  
able. .... £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at  
the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

### The Cumberland Railway & Coal Company

Are prepared to deliver this well known  
Steam Coal at all points on the lines of  
G. T. R., C. P. R. and I. C. Railways.

Head Office: 107 ST. JAMES STREET, MONTREAL

Address: P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

**The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.**

Mining concessions are divided into three classes :—

1. In unsurveyed territory (*a*) the first class contains 400 acres, (*b*) the second, 200 acres, and (*c*) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (*a*) as a mining concession by purchase, or (*b*) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(*b*) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction or 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

---

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

---

### GOLD AND SILVER.

Under the provisions of Chap. 1. Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are : Copper, four cents on every unit ; Lead, two cents upon every unit ; Iron, five cents on every ton ; Tin and Precious Stones, five per cent. ; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**  
Commissioner Public Works and Mines,  
HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite ; copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

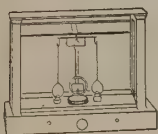
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.

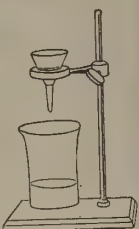


## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.

### ASSAYERS and CHEMISTS

### SUPPLIES.

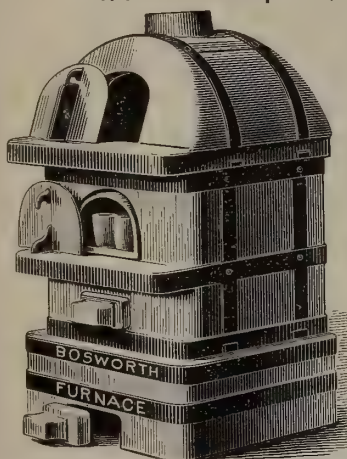
MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

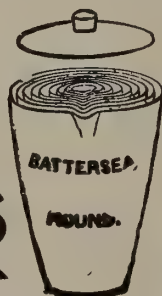
and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.



## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

### COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS.....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

Munktel's Swedish Filters.

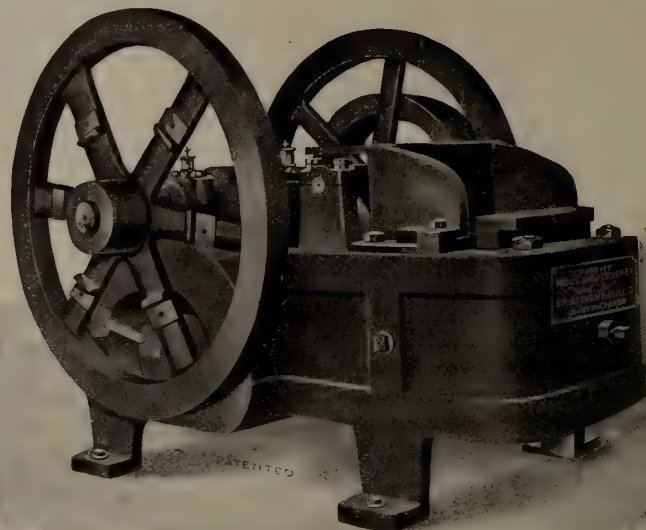
OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET

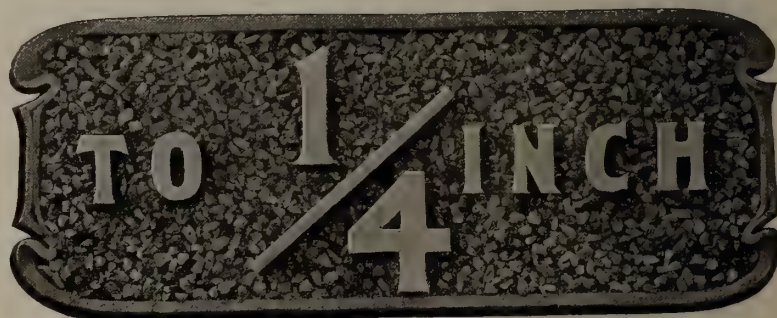
MONTREAL.

## ROLL JAW CRUSHER



Direct product actual size from a ROLL JAW CRUSHER without screens

The only machines able to crush  
large, hard ore



Do not clog

Can also do coarse work

Jaw Crushers work at 1-5 the cost of other machines;  
therefore crush fine, and increase capacity and save wear of your  
stamps, rolls and mills by feeding quarter and half-inch ores.  
Nothing pays better. Hundreds of Roll Jaw Crushers in use.  
Best references.

Send for catalogue "1903," of Crushing,  
Grinding and Screening Machinery.

## STURTEVANT MILL Co.

BOSTON, MASS.

Stocks in Denver and Salt Lake City  
Also represented on the coast.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.  
Wire specially selected for own exclusive use.  
We have made many records with our Winding, Haulage and Crane Ropes.

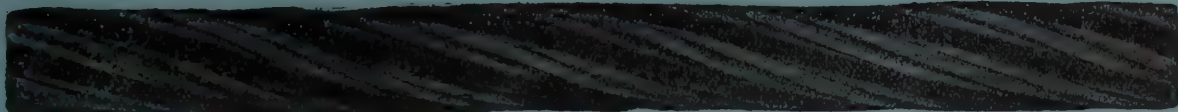


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steam Pumps. Tool Steel.

COMPLETE STOCK KEPT IN MONTREAL...

**General Offices: CANADA LIFE BUILDING - MONTREAL.**

**Montreal Pipe Foundry Co.**

Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

**Canada Life Building - MONTREAL.**

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES:

**CANADA LIFE BUILDING, MONTREAL.**

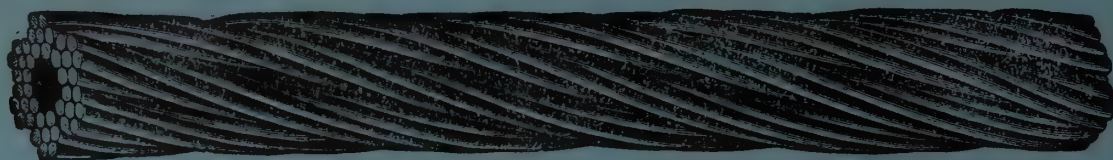
**Geo. E. Drummond, Managing Director and Treasurer.**



# THE DOMINION WIRE ROPE CO. LIMITED

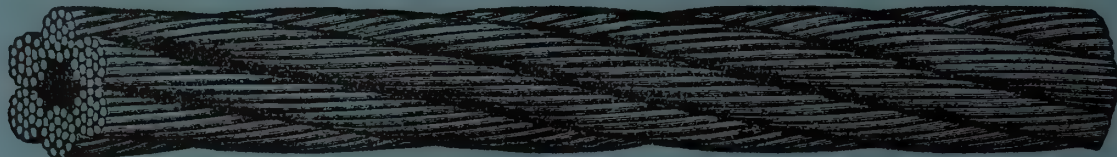
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

### LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**JAMES COOPER**

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS

Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

CATALOGUE  
ON  
APPLICATION

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.



TWENTY-FIRST YEAR OF PUBLICATION

# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. II.

OTTAWA, FEBRUARY 28th, 1903.

Vol. XXII—No. II.

|                                                                                    |                                                                                                                                                                                                        |                                                                                      |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  | <p><b>THE CANADIAN RAND DRILL CO</b><br/>SHERBROOKE, QUE.<br/>BRANCH OFFICES IN<br/>MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.<br/>ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD,<br/>VANCOUVER, B.C.</p> |  |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co

ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larsio's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

# THE WM. HAMILTON MANUFACTURING CO. LIMITED

ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.





# CANADIAN MINING INSTITUTE

## ANNUAL MEETINGS

The Annual General Meetings of the members of the Canadian Mining Institute for the transaction of business, the discussion of papers, etc., will be held in the

**Club Room, Windsor Hotel, Montreal**

ON

**WEDNESDAY, THURSDAY and FRIDAY,  
....4th, 5th and 6th MARCH, 1903....**

### SINGLE FARE ON RAILWAYS.

BY special arrangement members will be carried to Montreal and returned for a SINGLE FARE on the Canadian Pacific, Grand Trunk, Intercolonial, Quebec Central and Canada Atlantic Railways. In order to secure this rate members and mining men who purpose being present at the meetings must obtain from their Ticket Agent the ordinary form of Convention Certificate provided by railways. They will purchase a one-way trip ticket to Montreal and on presentation of Certificate duly vized by the undersigned will be returned free of charge.

### INSTITUTE GOLD MEDAL.

The Council of the Institute will award a Gold Medal for the best paper contributed by members to the Transactions of the Institute during the year 1903.

### STUDENTS' PRIZES

In addition to the President's Gold Medal the Council offers three prizes of a cash value of twenty-five dollars each for the best papers contributed by Canadian mining students on the following subjects:—

- GROUP I.—ORE DEPOSITS AND MINING GEOLOGY—The subject may be treated generally, or some particular district or single deposit may discussed or described.
- GROUP II.—MINING PRACTICE—Any and every branch of mining may be treated such as pumping, hoisting, ventilation, timbering, ore extraction, development, etc., etc., or some particular method of mining, or some individual mine or group of mines, may be described or discussed.
- GROUP III.—ORE DRESSING AND METALLURGY—Any branch of ore dressing or metallurgy may be treated as for example—crushing, jigging, milling, concentrating, smelting, roasting, cyaniding, etc., or some particular plant may be described or discussed.

Competitors must advise the titles of their subjects to the Secretary of the Institute not later than the 18th of February next and MSS. must be sent to him on or before the opening session of the meeting on 4th March.

### SYLLABUS OF PAPERS.

Syllabus, embracing over forty papers, and detailed programme of arrangements for these meeting will be mailed to members in due course.

**CHARLES FERGIE,**  
President.

**B. T. A. BELL,**  
Secretary.



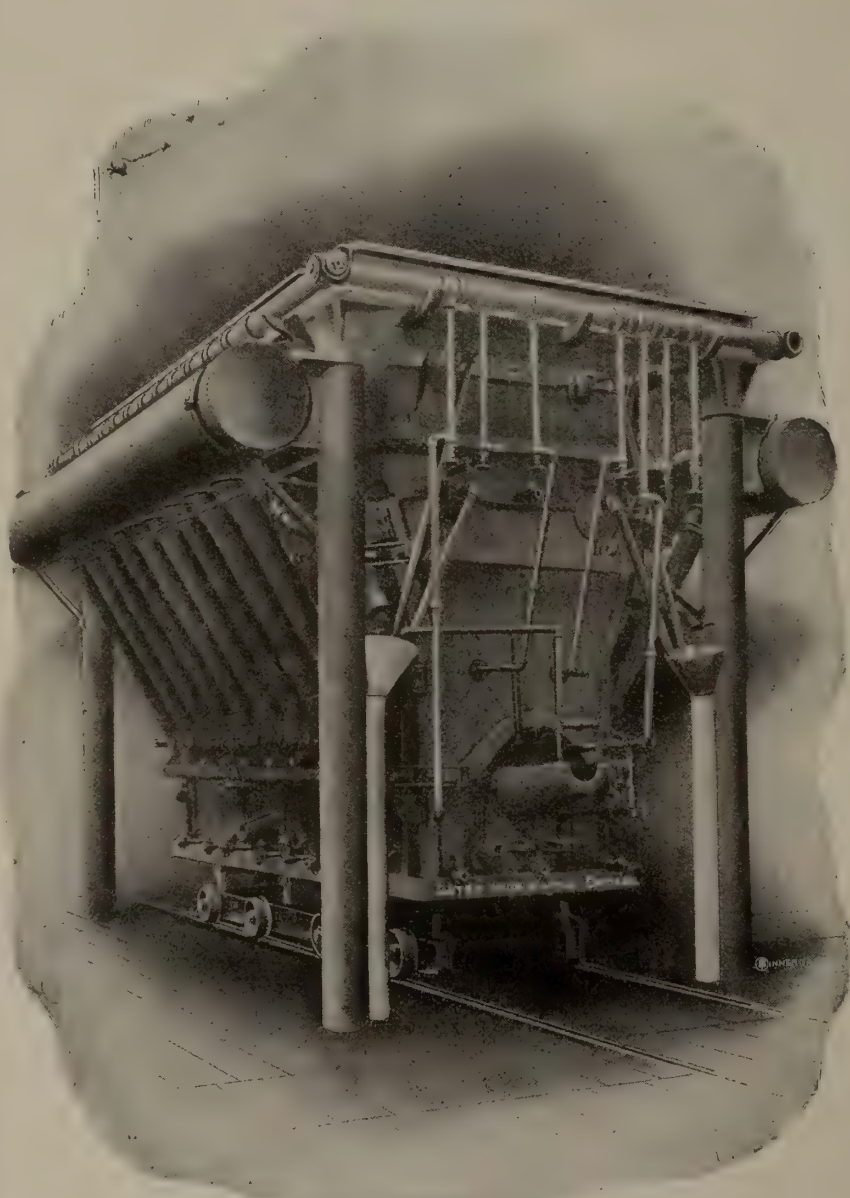
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO. FRASER & CHALMERS. GATES IRON WORKS. DICKSON MFG. CO.  
Milwaukee, Wis. Chicago, Ill. Chicago, Ill. Scranton, Pa.

WE ARE EXTENSIVE BUILDERS OF

## Smelting Machinery



RECTANGULAR WATER-JACKETED COPPER FURNACE. Size, 44 in. x 160 in.

This illustration shows one of four 44 in. x 160 in. Steel Water-Jacketed Copper Furnaces built by us for the Granby Consolidated Mining & Smelting Co., of British Columbia.

This furnace, which embodies all the latest improvements in copper smelting, has an extraordinarily large capacity and is giving most excellent satisfaction.

For the past thirty years we have made the manufacture of Copper and Lead Smelting Plants a specialty.

We have the largest shops in the world devoted to this class of work, equipped with the most improved machinery.

WE BUILD

Copper and Lead Furnaces  
Copper and Lead  
Smelting Plants  
Copper Converting Plants  
Copper Converters

SOLE BUILDERS OF

## REYNOLDS BLOWING ENGINES

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
PITTSBURG, 1212 Frick Bldg.  
MINNEAPOLIS, 416 Corn Exchange Bldg.  
DENVER, 1649 Tremont St.

GENERAL

CHICAGO,



OFFICE:

ILL., U.S.A.

HOME INSURANCE BUILDING.

### BRANCH OFFICES:

SALT LAKE CITY, Dooly Block.  
SPOKANE, 512 First Ave.  
SAN FRANCISCO, 623 Hayward Bldg.  
LONDON, ENG. 160 Dashwood House.



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO. FRASER & CHALMERS. GATES IRON WORKS. DICKSON MFG. CO.  
Milwaukee, Wis. Chicago, Ill. Chicago, Ill. Scranton, Pa.

SOLE BUILDERS OF THE

## Brown Roasting Furnace



SOLE BUILDERS OF THE

## Holthoff-Wethey Roasting Furnace



SOLE BUILDERS OF THE

## Jackling Roasting Furnace

All Ores and Mattes in a pulverized condition which require roasting for subsequent metallurgical operations can be satisfactorily roasted in any of the above furnaces. Sizes, cost and other information cheerfully furnished.

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
PITTSBURG, 305 Cey. Nat. Bank Bldg.  
MINNEAPOLIS, 118 Corn Exchange Bldg.  
DENVER, 1649 Tremont St.  
SALT LAKE CITY, Dooly Block.

### GENERAL

### OFFICE:

CHICAGO,



ILL., U.S.A.

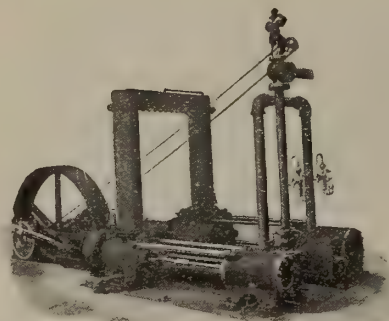
HOME INSURANCE BUILDING.

### BRANCH OFFICES:

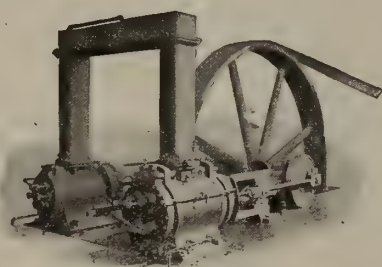
SPOKANE, 512 First Ave.  
SAN FRANCISCO, 137 Montgomery St.  
CITY OF MEXICO, 8 Calle Gante.  
LONDON, ENG., 160 Dashwood House.



# THE CANADIAN RAND DRILL CO.



Class B-D Compressor  
[Air Cylinders next to Frame]



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Duplex (Meyer-Valve) Compressor



Straight Line Belt Driven Compressor



Cross-Compound Corliss Compressor

**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

# IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



#### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

#### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON, ONT.



# INGERSOLL-SERGEANT

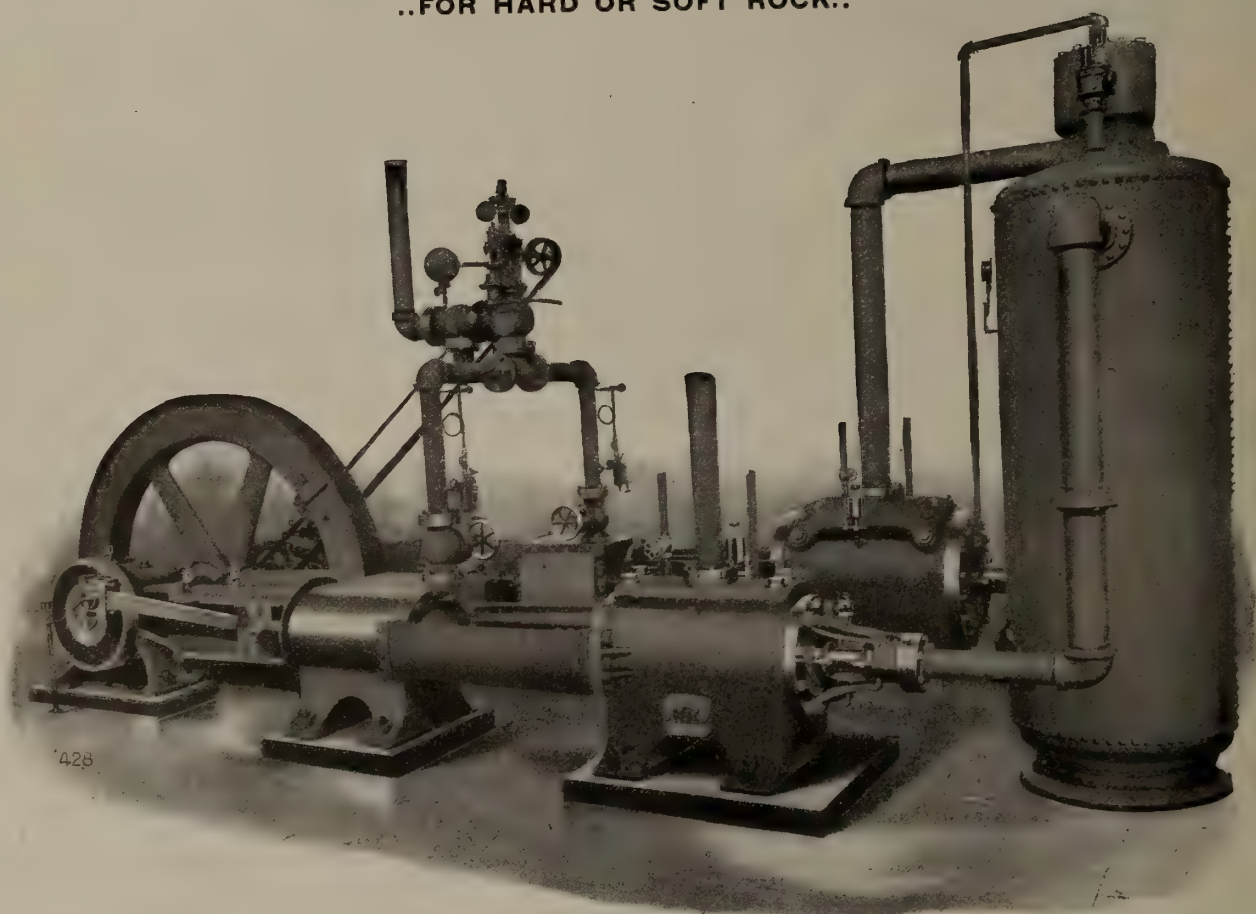
## AIR COMPRESSORS

...SIMPLE OR COMPOUND...

AND

## ROCK DRILLS

..FOR HARD OR SOFT ROCK..



DUPLEX STEAM ACTUATED COMPOUND AIR COMPRESSOR, CLASS G  
With Compound Double Acting Air Cylinder and Receiver Intercooler.

COMPLETE MINING AND QUARRYING PLANTS.

# JAMES COOPER MAN'F'G CO. LIMITED

## MONTREAL.

BRANCHES—124 Hollis St., Halifax, N.S.

c/o Diamond Drill Co., Rat Portage, Ont.

P.O. Building, Rossland, B.C.

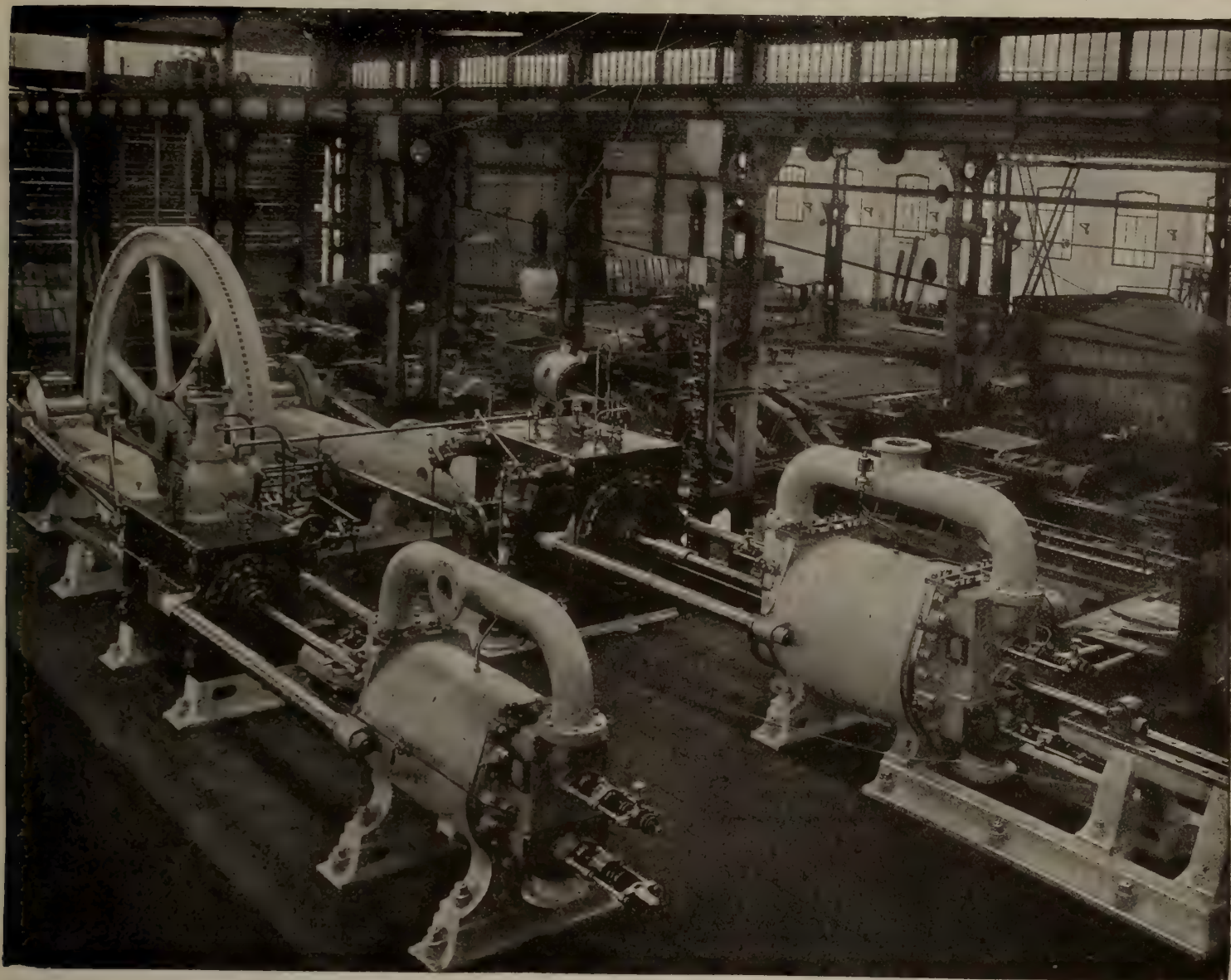


# WALKER BROTHERS

## WIGAN, ENGLAND

# AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery :-

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRS,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons

## Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

# MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL

... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

J. BASZANGER &amp; CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

# STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{2}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

**Steel Works and Head Office : NEW GLASCOW, N.S.**



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduou," New York.

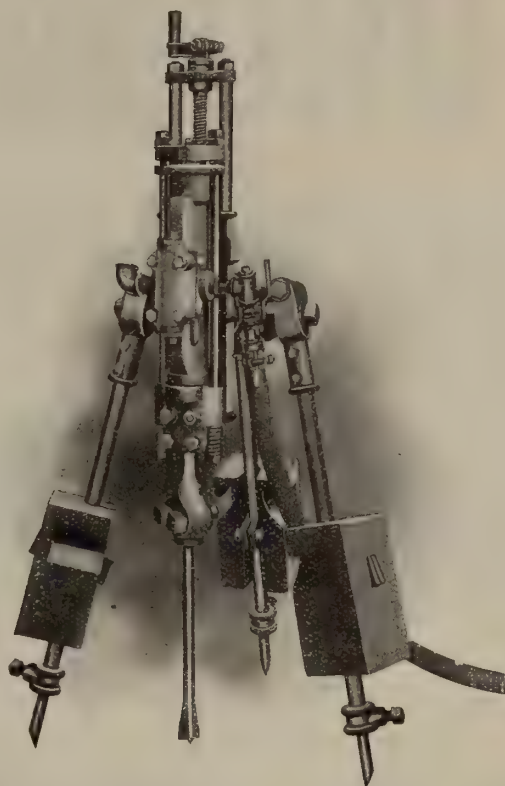
# ROCK DRILLS



# Sullivan Rock Drills

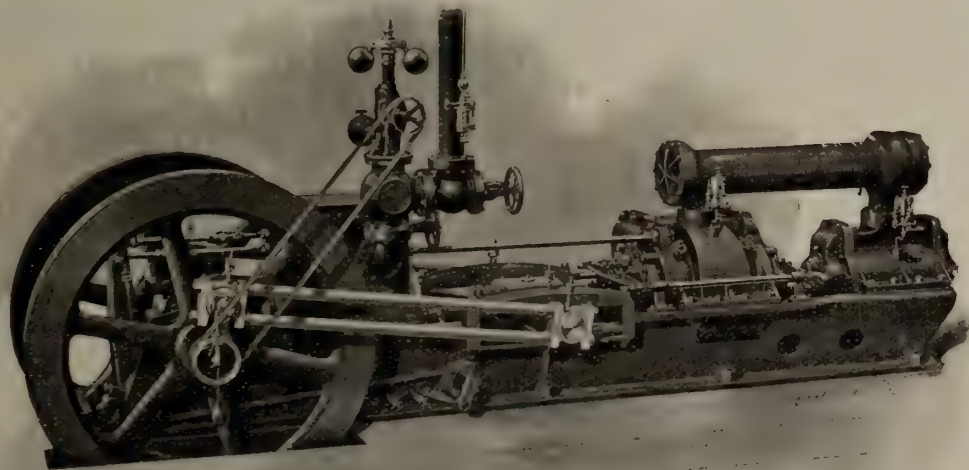
GREAT CAPACITY  
FEW WORKING PARTS  
SMALL REPAIR COSTS

SULLIVAN and BULLOCK  
DIAMOND CORE DRILLS.



# AIR COMPRESSORS

COMPLETE LINE



MODERN  
EFFICIENT  
ECONOMICAL

HOISTING  
ENGINES.

To insure Prompt Attention,  
address Dep't 7.

# SULLIVAN MACHINERY CO.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.

135 ADAMS STREET  
CHICAGO - - U. S. A.

NEW YORK  
PITTSBURG



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence

in Bituminous Coal and Coke

for Blast Furnaces, Foundries,

Manufacturing and Domestic

Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
on Intercolonial Railway and Connections by the . . .

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office : MONTREAL, Que.

**JAS. P. CLEGHORN,**  
President.

**CHARLES FERGIE,**  
Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

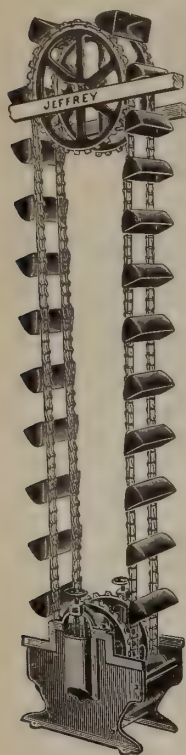
M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.

**C. SHIELDS, 2nd Vice-President and General Manager.**





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

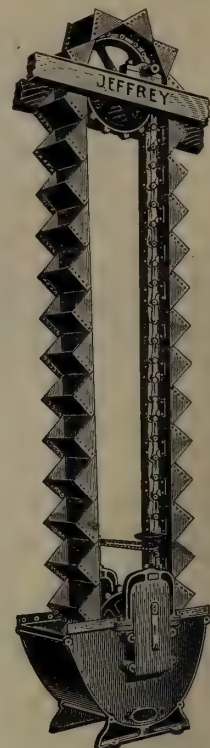
COAL CUTTERS

Power Drills

Screens

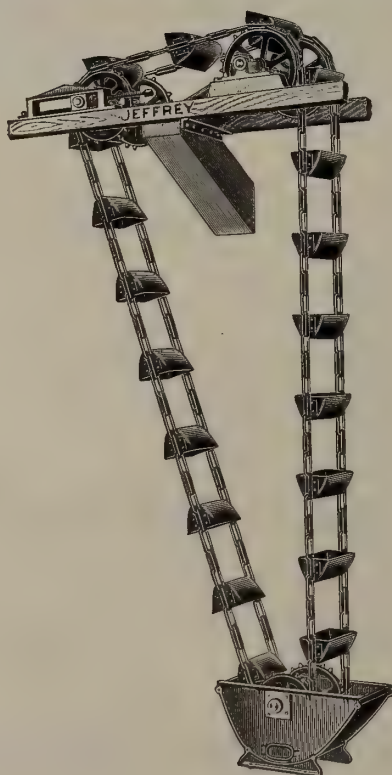
Crushers

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.

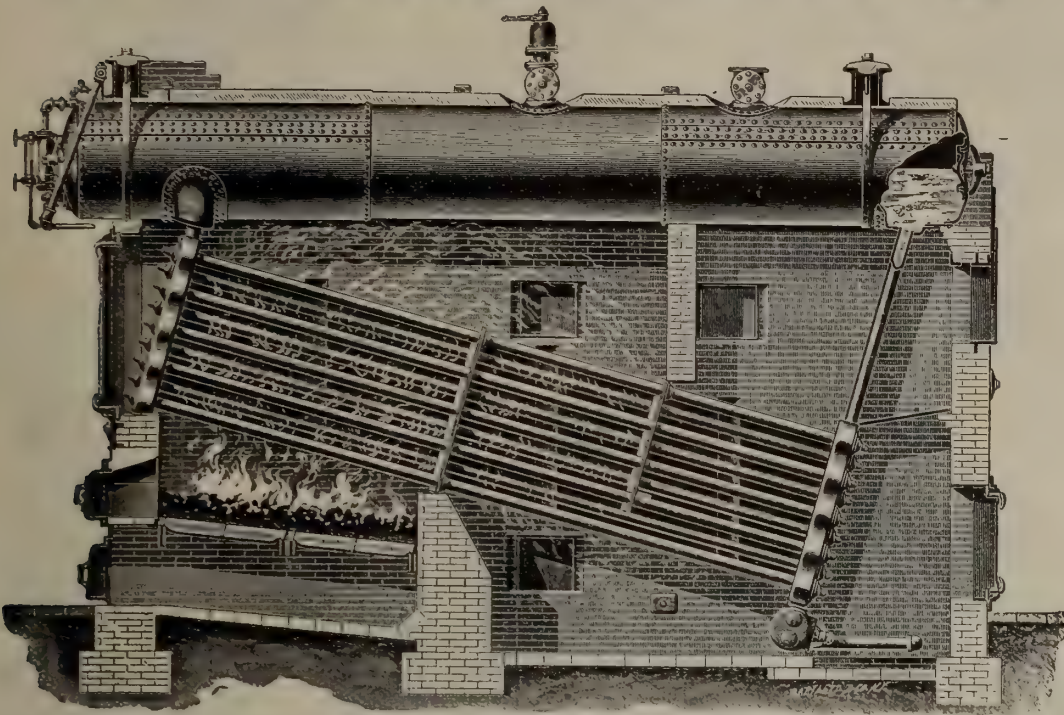


NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL  
**Caledonian Iron Works Co. Limited**  
**MONTREAL, Que.**

**BOILERS** TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY  
GEARS, PULLEYS, HANGERS  
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

**WORTHINGTON PUMPS**

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company .



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

**Victor Electric Platinum Fuses.**

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

**Blasting Machines.**

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

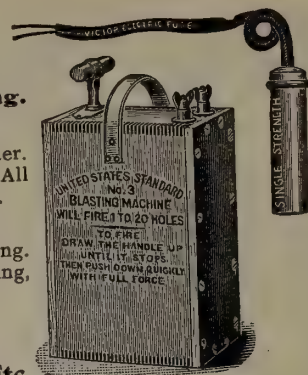
**Victor Blasting Machine.**

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

**Insulated Wires and Tapes,**

**Blasting Caps, Fuse, Etc.**

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**



SEND FOR  
CATALOGUE

## Hamilton Powder Company

### Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

# WIRE ROPE

**"WHITECROSS" Best English Rope**

Plough Steel and Other Grades.

Imported Promptly at Lowest Prices.

**A. C. LESLIE & CO., Canadian Agents, Montreal.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF . . .

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and Lachine Locks, P. Q.

# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam

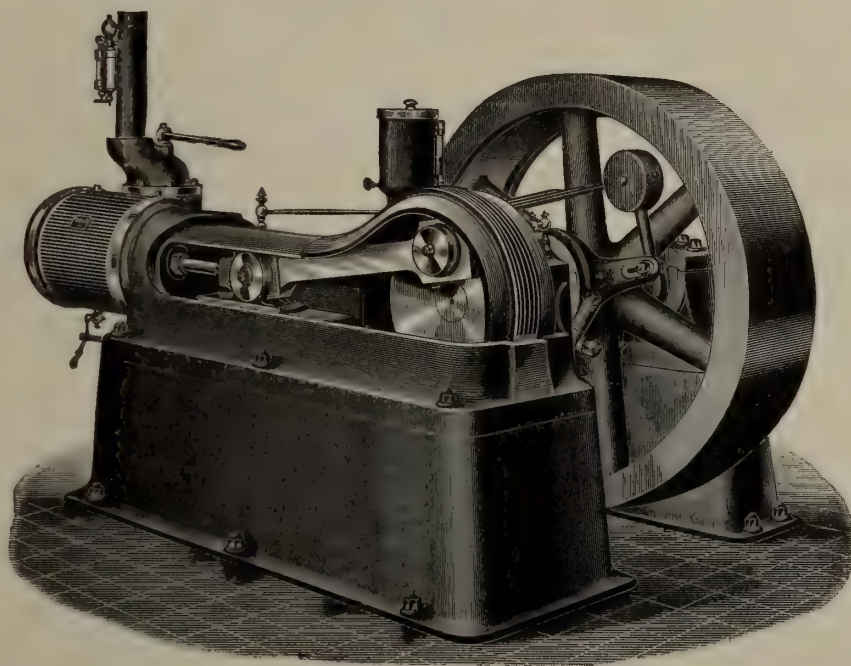
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron

Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulcan Iron Works. **OTTAWA**



# Saved \$25 per Month.



A customer says :—

“We find the 100 horse power engine bought from you very satisfactory. The saving in fuel is about \$25 per month over the engine we were running before.”

## Robb Engineering Co. Ltd.

AMHERST, N.S.

Agents { WILLIAM McKAY, 19 McKenzie Crescent, Toronto.  
WATSON JACK & CO., 7 St. Helen St., Montreal.



THE  
Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

Great Mining  
Regions

OF

British Columbia, the  
Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

SCHOOL of MINING

Practical Science Faculty of  
Queen's University

Kingston, Ontario.

THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN
 

GROUP I.

  - (a) Mining Engineering.
  - (b) Chemistry and Mineralogy.
  - (c) Mineralogy and Geology.
  - (d) Chemical Engineering.

GROUP II.

  - (e) Civil Engineering.
  - (f) Mechanical Engineering.
  - (g) Electrical Engineering.

GROUP III.

  - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
October 1st, 1902.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE

## WIRE ROPE

FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

**RICE LEWIS & SON**  
 LIMITED  
 TORONTO  
 HARDWARE

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

### STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.  
 RAILROAD WRECKING CARS AND PILE DRIVERS. CENTRIFUGAL DREDGING PUMPS.

For Miners Pit Sinkers **DYNAMITE AND EXPLOSIVES** For Quarrymen Contractors  
 ... Manufacturers and Dealers in ...

### ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
 President.  
 C. A. MACPHERSON,  
 Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

### School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

**L. B. STEWART, Secretary.**



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
**LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.**

Telegraphic Address:  
LOBNITZ, RENFREW      A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

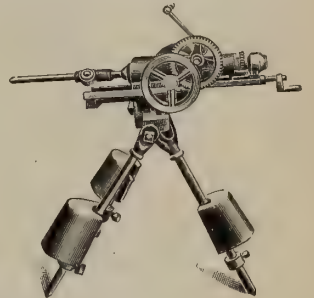
It Saves Steel,

It Saves Labor,

It Saves Money.

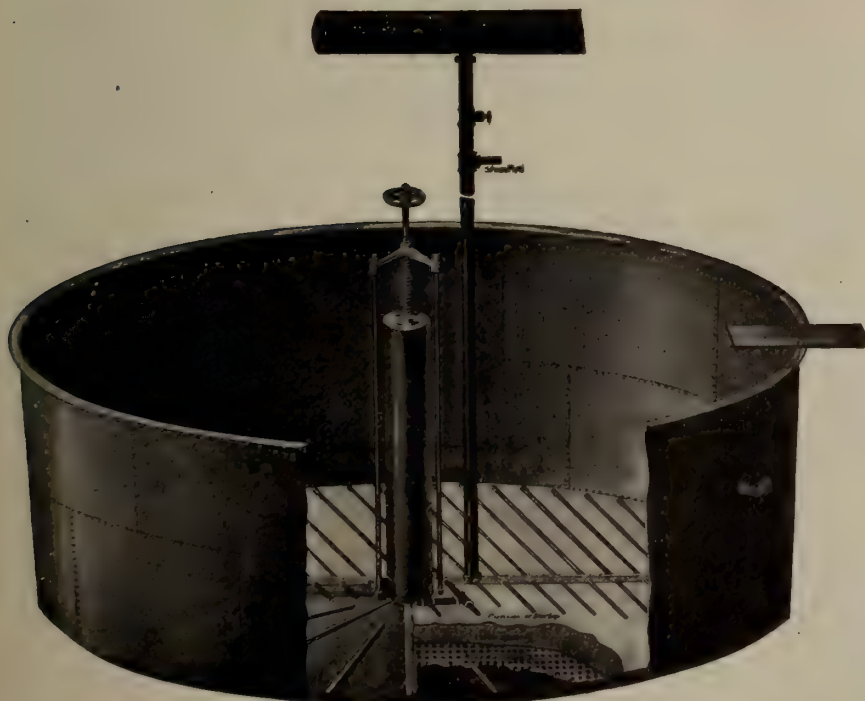


Write for Catalogue.



**H. D. CRIPPEN** SOLE MANUFACTURER **52 Broadway, New York**

## The Colorado Iron Works Co. DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.  
DENVER, Colo.**



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
Metals, Mattes, Etc.  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .

Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

## C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.  
SPECIALTIES:

Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## ORFORD COPPER CO.

74 BROADWAY, NEW YORK.

### Copper and Nickel Smelters

WORKS AT CONSTABLE'S HOOK, N. J.  
Opp. New Brighton, Staten Island.

Copper Ore, Mattes, or Bullion Purchased. Advances  
made on Consignments for Refining and Sale.

Specialty made of Silver-bearing Ores and Mattes—  
Copper Ingots, Wire Bars and Cakes—Ferro-Nickel  
and Ferro-Nickel Oxides for use in preparing Nickel  
Steel for Armour Plates.

**NICKEL AND NICKEL OXIDES.**

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reserva-  
tions covering nearly a quarter of a million acres in  
Eastern Ontario, and principally within the belts con-  
taining Iron, Phosphate, Gold, Galena, Plumbago,  
Mica, Marble, Building Stone, and other valuable  
minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,

Wolframite,

Chrome Ore,

Nickel Ore,

Cobalt Ore,

Cerium, and

all Ores

and

Minerals

Talc,

Mica,

Barytes,

Graphite,

Blende,

Corundum,

Fluorspar,

Feldspar.

LARGEST BUYERS. BEST FIGURES.

ADVANCES ON SHIPMENTS.

CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEERRoom 2, Windsor Hotel **Montreal.**20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street **MONTREAL****ASSAYS OF ORES**ANALYSES of all materials made with greatest accuracy.  
SAMPLES BY MAIL—1 cent per 4 ozs.; limit 24 ozs.  
INSTRUCTION IN ASSAYING, Etc., to Prospect-  
ors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,

**MONTREAL.**Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway

NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.

8-KING STREET-8

**MANCHESTER, ENGLAND.****J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

**Montreal.****A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

879 DORCHESTER STREET, MONTREAL

CANADA.



## The Farrel Patent Crusher

Sizes :

**STANDARD**

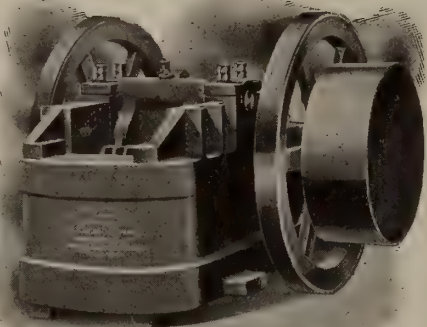
7 x 10 to  
42 x 30.

**DUPLEX**

40x6 to 72x8

**PORTABLE**

7 x 10  
16 x 10



Capacities  
Ranging from  
50 to 1500  
tons per 10  
hours  
depending on  
size of  
product  
required.

MAY WE SEND 1903 CATALOGUE.

Constructed with frame of solid semi-steel, steel Pitman, and jaw plates of chilled iron or manganese steel, this crusher has no superior.

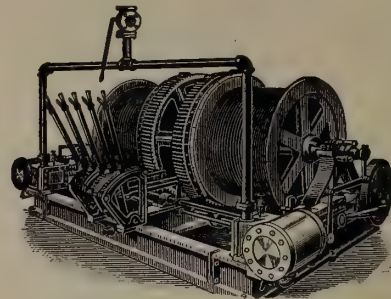
PRICES ON APPLICATION

**The Jenckes Machine Company**

HEAD OFFICE **Sherbrooke, Que.** 27 Lansdowne St.

**M. BEATTY & SONS,**

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS :

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# WIRE ROPE

"ACME" brand extra tensile strength for heavy work.

Should only be used on special large wheels and drums.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.

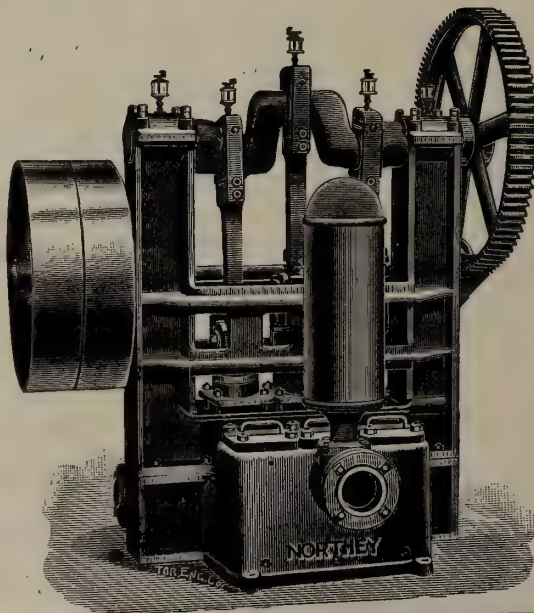
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 2.

FEBRUARY, 1903.

VOL. XXII., No. 2.

## The Walker Graphite Deal.

In its last issue the REVIEW noted the re-incorporation of the Walker Mining Company under the laws of New Jersey, and intimated that there might be more to say concerning this promotion. As this property has earned a somewhat notorious reputation during the last twenty years, it is quite worth while to examine the prospectus of the new Company in order to ascertain what, if any, new uses or new markets have been found to justify the printed estimate of a 25 p. c. per annum dividend on a capital of \$1,125,000 with fixed charges amounting to \$64,000 a year. And in reciting some of the facts concerning the past history of this enterprise, it is not proposed to draw conclusions, but only to point out to our readers some of the facts which were obtained during an exhaustive examination of this property some years ago by two eminent Mining Engineers both of whom are well known to the Canadian public.

The new company which has been organized under the laws of New Jersey has a share capital of \$1,125,000.00 and a bond issue of \$400,000 bearing 5 p. c. interest, payable in ten years at 110.

The original Walker Mining Company acquired its property from the "Dominion of Canada Plumbago Company," prior to the year 1888. Difficulties, not alone due to concentration problems, caused this mine to remain idle until the early nineties, and closed it in 1896, and the prospectus now under consideration informs us that during these earlier years over \$400,000 were locked up in lands, works, and mining expenditures, and, we might add, in personal expenses.

As early as 1866 Sir Wm. Logan, in the reports of the Geological Survey of Canada, described the occurrence of graphite on the same lots and ranges that are now included in the property of the Walker Mining Co. Some of these occurrences are as lenses in crystalline limestone, others are reticulating small veins of columnar graphite, with widths averaging from 2 to 4 inches in thickness, but by far the larger part of the deposits occur as flakes of graphite disseminated in the country rock, which is usually gneiss. The graphite of the small veins is columnar, or fibrous, in structure, the veins vary from a fraction of an inch to six inches in width, and they generally occur in the same gneissic rock which contains the disseminated ore, although the veins ramify and occasionally cut into the granites and gabbros of the region. The graphite of these small veins is very pure, being almost free from impurity, but is of course exceedingly limited in quantity. The prominent feature, and the great reservoir, of graphite is the graphitic gneiss, or "Sillimanite" gneiss as it has been called. In these gneissic bodies the graphitic enrichment usually occurs in

streaks where an igneous rock has come into contact, or close proximity, with the gneiss and in many places the proximity of this eruptive is presumably responsible for the introduction of a quantity of pyrite which on weathering, gives the rusty coating by which these gneisses are discovered in prospecting the country.

The percentage of graphite contained in such gneissic bodies is very variable, ranging from 4 p.c. or 5 p.c. to as high as 30 p.c., but the average, as determined by one of the engineers above referred to, approximates 15 p.c.; it would be possible so to direct mining operations as to obtain an average of about 20 p.c. of graphite in the rock going to the mill, and this is the fundamental point in any consideration as to the market value of the property and as to the amount and quality of the material which can be put upon the market. As the former company suspended operations in the winter of 1896-1897 the \$400,000 which has been expended is represented at the present time only in the deposit itself, since the works, mills, etc., etc., which were condemned at that time can have little, if any, value seven years later. The principal mill building was three stories high and covered an area of between 8,000 and 9,000 square feet. The lower floor contained the crushing and washing apparatus, and the two upper stories carried a conglomeration of bolting screens, cleaners, accessories for finishing the product, some of which may be used in a rearrangement of the plant, but the lower floor was fitted with an antiquated stamp battery that at the most was only scrap iron, and the engine for operating the mill would not be commended for its pattern or its consumption of steam; the six dressing buddles on the floor were warped and out of repair, and by this time are probably of value only for the scrap heap; the rest of the plant which was made up of driers, small runs of stones for grinding, with blowers, mixers, etc., etc., will probably be estimated as of little or no value by a disinterested person. The saw mill is a thing of the past, as also the barrel shop, and most of the additional outlying plant and buildings.

The actual condition of affairs at the close down in 1896 was, that but a very small portion of the flake or amorphous graphite, recovered from the gneiss was in the form of good flake graphite suitable for pencils; lubricants, or stove polish. Fully 80 p.c. of the graphite recovered was so earthy and badly cleaned that it was available only for paints, or, the better grades for foundry facings and adulterants for rubber packing. The engineer's estimate of possible recovery (then made) was as follows:—

1 ton, containing 20 p.c. C. = 400 lbs. graphite recoverable as follows:  
20 p.c., or 80 lbs., as No. 1 Flake Graphite.  
20 p.c., or 80 lbs., as No. 2 Graphite.  
50 p.c., or 200 lbs., as Grits, fit only for paints and adulterants at low prices.



10 p.c., or 40 lbs., lost as slimes, too gritty to be cleaned or saved.  
 For the No. 1 Flake 4c. a pound might be realized, or  $80 \times .04c. = \$3.20$   
 For the No. 2 Flake 2c. a pound might be realized, or  $80 \times .02c. = 1.60$   
 For the Gritty stuff, 1c. a pound, or  $200 \times .01c. = 2.00$   
 \$6.60

The above figures show a total value in 1896, per average ton of ore, of \$6.60 from which must be deducted costs of management, mining, cleaning and *fixed charges*, which at present amount to \$44,000 a year for redemption and \$20,000 a year for interest, or a total of \$64,000.

No attempt is made to name the marketing charges, although this is the rock upon which previous attempts to work this property have foundered. In other words, any attempt to mine these Buckingham graphite deposits on a large scale *must* include a capital, and an organization, sufficient and competent to manufacture and *sell* all the products into which graphite enters as a primary factor; no concern which neglects to make its various grades into stove polish, lubricants, paints, etc., and which does not market them for itself, can expect to obtain any adequate return for its investment. It has been well established that to mine, make and sell only number 1 flake invites deliberate failure for the enterprise. It has also been well said that profitable results cannot be expected without such a large and extensive plant as is necessary for the manufacture of various products; and also without a capital sufficiently large to enable such working, manufacturing and selling to be carried on at a loss, *perhaps for several years*, until the difficulties of introducing the various products into markets which are now well supplied and strongly prejudiced in favor of other brands, are overcome.

If the new Walker Mining Company can call up one half of its capital and, above all, can command a staff which should comprise an *economical* general manager, a skilled concentrating engineer, and several energetic travelling business agents, it may have an even chance for life, but without these requisites in any one respect, it deliberately invites failure and equally deliberately announces its complete ignorance of the past business history of this well known deposit. The facts are open for its share holders to obtain, and the market is not essentially different in its demands to what it was ten years ago. The only new feature which the printed prospectus contains is the possibility of making a desirable product in the shape of a refractory brick, but we do not need to point out to our readers that the waste coming from graphitic gneiss, associated with fragments of gabbro, is not likely to form a suitable binding material for graphite, nor is such material to be designated as "refractory." Clean graphite, suitably mixed with pure silica, might make an excellent material, but graphite waste moulded into bricks will require considerable demonstration.

### The Fernie Strike.

It must be a matter of great regret, as it is in every sense a serious one, that the coal miners at Fernie are once more on strike. What the effect may be to the mining and smelting industries of the Province it is impossible to say, and indeed this will entirely depend upon whether the disagreement is speedily settled or not. If it drags on until the very slender supplies of fuel in stock at the various smelters are consumed it is impossible to tell what the consequences may be as supplies cannot be obtained from any other source, and if the smelters are once put out there will be very little encouragement in the present depressed condition of the copper and lead markets to resume operations.

On the merits of the question in dispute we have nothing to say because obviously it would be imprudent to express an opinion on a fair wage or otherwise, without having all the data necessary to arrive

at a fair decision, but there are several aspects of the case to which we wish to refer and which are well worthy of consideration.

The first is that whatever the relative value of the wages paid may be when compared with others it is not denied that the men's earnings are large and in the present depressed state of trade in British Columbia they should at least hesitate before precipitating a struggle that may be both prolonged and disastrous.

In the next place, from a press despatch, dated "Fernie, February 18th," we learn that the actual number of men who voted in favour of a strike constituted a very small minority of the total number employed, as a matter of fact not more than one-fifth. It seems to us that to take so serious a step on such a vote is indefensible. There are occasions on which it is perfectly legitimate to strike and possibly this may have been one, but if so it cannot be denied that steps should have been taken to obtain a much larger vote, and that so serious a course should not have been decided upon by so small a minority. Probably the various unions which took the lead in the strike acted strictly in accordance with the rules of their organization and no doubt a majority of those present at each meeting actually voted in favour of the strike, but this only emphasizes our contention that the Union should improve its organization or it can never gain any public confidence or support; the least that should be done under such circumstances is to follow somewhat upon the lines of the referendum and insist that a majority of the workmen actually employed should vote in favour of a strike before that extreme course is resorted to.

The last consideration and possibly the most important of all is based upon what is alleged to be a fact, namely that the whole agitation has been brought about through the agency of American Representatives who settled at Fernie for the express purpose of fomenting strife. On this point we wish to say that in our judgment Trades Organizations are perfectly legitimate, we only take exception to some of their methods, but not to the principle of organization, which is legitimate in the case of workmen as of employers, but we have always believed that there are most potent economic and political reasons why Canadian Unions should not be controlled by United States organizations. It is not necessary here to recite these reasons, they will be perfectly obvious to the veriest tyro and no one who has considered the matter doubts that there are many points at which they clash. Some effort has recently been made to emancipate Canadian Unions from this control and we can only hope that the effort will be successful, for undoubtedly the Fernie strike is another illustration of the iniquity of the present system under which men who have no stake in the country are able at their will to paralyze an important industry and to plunge a whole district into commercial disaster.

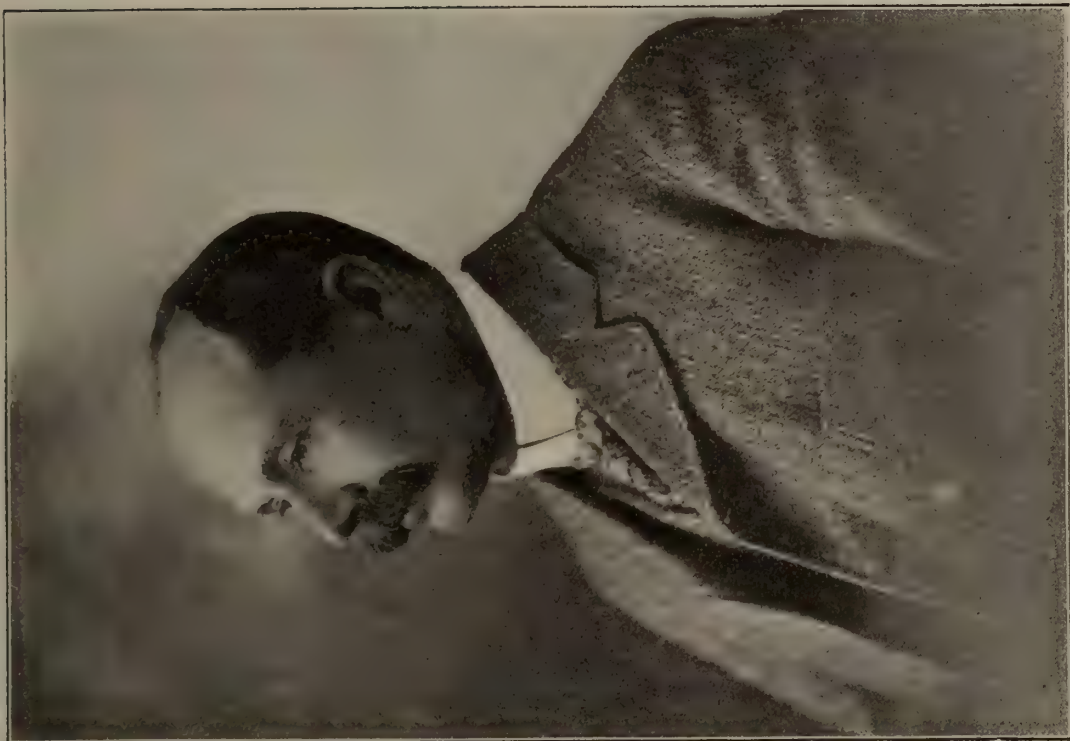
### A Minister of Mines.

It will be within the recollection of our readers that at the last Annual Meeting of the Canadian Mining Institute the subject of a new department of mines was freely canvassed, and a resolution adopted urging the Dominion Government to take this matter into consideration. The appointment of Dr. Haanel as Superintendent of Mines raised great expectations amongst mining men in consequence of the well known capacity and acquirements of that gentleman; but it would appear as if there is little probability of such a department being organized unless there is a responsible Minister at the head. This does not reflect in any way upon the ability with which the affairs connected with mining matters have been conducted by the Minister of the Interior, but there is a general consensus of opinion that this work does not properly belong to his department, and that its increasing importance demands the undivided attention of a Minister who





MR. EUGENE COSTE, M.E., TORONTO  
Nominated as President of the  
Canadian Mining Institute for  
the year 1903-1904.



MR. THOMAS CANTLEY, NEW GLASGOW.  
General Manager Nova Scotia Steel and Coal Company.



MR. S. F. PARRISH, E.M.  
Recently appointed General  
Manager of Le Roi Mine,  
Rossland, B.C.



alone would be able properly to urge and maintain its interests in the Cabinet. It is not necessary to prove that the mining industry is an important one but possibly it is not generally understood that the value of mineral products exported, greatly exceeds the value of the fisheries export, products of the forest, is almost equal to the agricultural products, and is not far below manufactures. Thus in 1902 the value of the

|                                                        |            |
|--------------------------------------------------------|------------|
| Mineral export was.....                                | 34,942,403 |
| Product of Fisheries.....                              | 14,143,294 |
| Product of Forest (Lumber included in manufactures) .. | 4,469,489  |
| Animals and products thereof was.....                  | 59,161,209 |
| Agricultural products.....                             | 37,152,683 |
| Manufactures.....                                      | 46,118,081 |

In consequence of the depression of the lead industry and the very considerable falling off the quantity of gold mined in the Yukon these figures do not compare as favourably as those of 1901, in which year the mineral exportation exceeded the value of every other classification except animals and products thereof. These figures are quoted to show the relative value to the country of the mineral industry. Without giving corresponding details for each classification we may point out that the total value of mineral production in Canada for 1902 will probably exceed \$80,000,000 and there is every indication that during the present year it will pass the \$100,000,000 mark. It can hardly be maintained that an industry of this value is not entitled to be represented in the Dominion Government by a Minister whose special duty it shall be to foster and encourage its development.

We are aware that many objections can be raised to this suggestion and that also the figures we have quoted would be misleading unless we pointed out that the bulk of the mineral property of the Dominion belongs to the several Provinces and is entirely subject to their control, but whilst admitting this we contend that the mineral lands belonging to the Dominion Government are considerable, consisting of the whole of this class of property in the North West Territories and the Yukon, together with an important and extremely valuable coal reserve in British Columbia. To administer these properties several officials are paid considerable salaries and it would be a distinct advantage that they should be responsible to a ministerial head. It may be objected that the Provincial Governments would resent any control from a federal minister and no doubt this is so but there are many things which could be done by such a minister to further the several interests of the Dominion, without in any way clashing with local and provincial susceptibilities. For instance, a department under the control of such a minister could undoubtedly obtain and classify most important information respecting the mineral resources and development of the country and these properly grouped and arranged would be of greater value than the fragmentary information which alone is now attainable. The minister would also be in a position to bring the claims of the Dominion before investors in a far more reliable manner than is at present done by men who are largely interested in the statements put forward. Undoubtedly there is too much Provincialism in Canadian affairs. It may not be so apparent to ourselves but it is very apparent to outsiders and is decidedly a disadvantage to the Dominion as a whole. English Capitalists for instance hear on one hand a great deal about Canada as a Nation, about our prosperity, our co-hesion, and our patriotism. On the other hand they are confronted with the spectacle of provincial representatives, each endeavoring to outvie his competitor in some other Province in setting forth the attractions and advantages of the mineral property under his control. It would certainly be more dignified and more in accordance with the general policy upon which we are endeavoring to consolidate the Dominion if this aspect of the matter were minimized and a broader and more comprehensive view of our resources were taken. It is hopeless however to expect that this

desirable end will be achieved except under the direction of a Dominion Minister, whose sole purpose will be to set forth impartially the resources of the Dominion without any reference to local interests.

We notice that efforts are being made to secure the appointment of a Minister of Mines in Ontario. This may or may not be a necessity, at any rate it is entirely a matter for the Province to decide for itself, but it has no general bearing whatever upon the question we are discussing, and which will, if adequately dealt with, we believe raise the great mining industry to a position of dignity and importance which it has not hitherto attained in the eyes of the world but to which it is undoubtedly entitled, both by reason of its unlimited resource and its considerable development.

### Imports of Mining Machinery.

The following are the official returns of the value of the mining and smelting machinery free and dutiable imported into Canada during the year ended 31st December last:—

| MONTH.       | UNITED STATES |          | GREAT BRITAIN |          | OTHER COUNTRIES |          | TOTAL     |
|--------------|---------------|----------|---------------|----------|-----------------|----------|-----------|
|              | Free          | Dutiable | Free          | Dutiable | Free            | Dutiable |           |
| January..... | \$66,236      | \$2,549  | \$26,328      | .....    | \$420           | .....    | \$95,533  |
| February.... | 42,486        | 2,380    | 637           | .....    | .....           | .....    | 45,503    |
| March.....   | 54,980        | 1,720    | 275           | \$9.9    | .....           | .....    | 57,884    |
| April.....   | 55,648        | 4,997    | 5,579         | 90       | .....           | .....    | 66,314    |
| May.....     | 90,623        | 4,723    | 197           | .....    | .....           | .....    | 95,602    |
| June.....    | 76,409        | 5,293    | 811           | .....    | 50              | .....    | 82,563    |
| July.....    | 47,441        | 2,171    | .....         | .....    | 67              | .....    | 49,682    |
| August.....  | 81,627        | 1,139    | 9,162         | .....    | 9               | .....    | 91,937    |
| September..  | 81,608        | 8,535    | 180           | 371      | 302             | .....    | 90,996    |
| October....  | 54,883        | 4,010    | 2,128         | 345      | .....           | .....    | 61,396    |
| November...  | 55,270        | 9,167    | 1,022         | .....    | .....           | 228      | 65,687    |
| December...  | 34,257        | 1,677    | 9,893         | 206      | 1,209           | .....    | 47,242    |
| Total...     | \$741,471     | \$48,450 | \$56,212      | \$1,921  | \$2,057         | \$228    | \$850,339 |

### Imports of Wire Rope.

The following figures from the Trade and Navigation monthly reports show the imports of wire rope into Canada during the year ended 31st December last.

It is worthy of the remark that 80,724 lbs. of a value of \$2,685 were imported from countries other than Great Britain and the United States.

| MONTH        | GREAT BRITAIN |          | UNITED STATES |          | TOTAL     |           |
|--------------|---------------|----------|---------------|----------|-----------|-----------|
|              | Lbs.          | Value    | Lbs.          | Value    | Lbs.      | Value     |
| January..... | 108,251       | \$6,101  | 98,864        | \$10,100 | 207,115   | \$16,201  |
| February.... | 58,552        | 3,981    | 34,239        | 3,257    | 92,791    | 7,238     |
| March.....   | 38,439        | 2,856    | 33,346        | 3,245    | 71,785    | 6,101     |
| April.....   | 96,158        | 5,447    | 17,866        | 2,169    | 114,024   | 7,616     |
| May.....     | 166,573       | 12,835   | 30,050        | 2,889    | 199,347   | 15,814    |
| June.....    | 170,990       | 12,058   | 50,703        | 5,115    | 221,693   | 17,173    |
| July.....    | 37,922        | 2,953    | 42,221        | 6,217    | 80,143    | 9,170     |
| August.....  | 61,009        | 5,591    | 43,124        | 4,011    | 104,133   | 9,602     |
| September... | 113,081       | 8,131    | 67,172        | 6,205    | 206,253   | 15,206    |
| October..... | 68,752        | 5,304    | 29,587        | 3,320    | 150,339   | 10,349    |
| November...  | 59,074        | 4,917    | 89,500        | 9,558    | 148,574   | 14,505    |
| December...  | 54,516        | 3,782    | 26,847        | 2,816    | 81,363    | 6,598     |
| Total...     | 1,033,317     | \$73,986 | 563,519       | \$58,902 | 1,677,560 | \$135,573 |

**Le Roi.**—Cable returns—Shipped to Northport during January, 16,377 tons of ore, containing 5,673 ozs. gold, 10,695 ozs. silver, 479,183 lbs. copper. Estimated profit on this ore, \$15,000. (December profit, \$41,000.)

**Anglo-Canadian Gold Estates.**—Mr. Allan Sullivan, the manager, cables as follows:—"7th February.—Started the machinery on the 5th February. Everything working well."





Interior of Furnace Plant Dominion Iron and Steel Company at Sydney, Cape Breton, showing Kettle discharging Molten Pig Iron into ingot cars for transmission to Converters.



## Gold Mining in Nova Scotia.

By courtesy of Dr. Gilpin we are able to give below details of the gold returns of Nova Scotia reported to the Mines Office for royalty during the year ended 31st December last. These show a slight advance over previous years, the bulk of the yield coming, as in previous years, from the Brookfield, Richardson, and Blue Nose mines. These mines have been steadily and economically worked, and have yielded excellent profits from the low-grade material milled.

The following statement, shows the gold returns reported to the Mines Department, Halifax, during the year ended 31st December, 1902:—

| COMPANY OR MINE.                                              | DISTRICT.              | CRUSHED. |      | GOLD YIELD. |      |     |
|---------------------------------------------------------------|------------------------|----------|------|-------------|------|-----|
|                                                               |                        | Tons.    | Cwt. | Oz.         | Dwt. | Gr. |
| Robert McKay.....                                             | Cow Bay.....           | 17       | 13   | 33          | 3    | 14  |
| Oldham.....                                                   | Oldham.....            | 772      | 10   | 614         | 17   | 12  |
| Royal Oak.....                                                | Sherbrooke.....        | 4310     | 7    | 2394        | 16   | ..  |
| Bluenose.....                                                 | ".....                 | 11211    | ..   | 2391        | ..   | ..  |
| Touquov.....                                                  | Caribou.....           | 1836     | ..   | 801         | 10   | 12  |
| Moose River Gold Mining Co.....                               | ".....                 | 1809     | 10   | 310         | 18   | 2   |
| Baltimore—N. S. Mining Co.....                                | ".....                 | 7314     | ..   | 1562        | 7    | ..  |
| West Lake Mining Co. (Donald Archibald and others).....       | Mt. Uniacke.....       | 691      | ..   | 1749        | 11   | 10  |
| National Mining Co.....                                       | ".....                 | 66       | ..   | 28          | 18   | 11  |
| Modstock Mining Co.....                                       | Stormont.....          | 280      | ..   | 109         | ..   | ..  |
| Richardson Gold Mining Co.....                                | ".....                 | 30455    | ..   | 3408        | ..   | ..  |
| Goldfinch Mining Co. (Howard Richardson <i>et al.</i> ).....  | ".....                 | 1005     | 5    | 645         | 15   | 3   |
| Strathcona Mine.....                                          | ".....                 | 3925     | ..   | 1558        | 2    | ..  |
| George F. McNaughton.....                                     | ".....                 | 20       | ..   | 1           | 10   | ..  |
| James A. Fraser <i>et al.</i> .....                           | ".....                 | 1010     | ..   | 341         | 4    | ..  |
| Tudor Gold Mining Co.....                                     | Waverley.....          | 156      | ..   | 13          | 3    | 16  |
| Waverley Gold Mining Co.....                                  | ".....                 | 8933     | ..   | 2835        | 15   | ..  |
| Alfred C. Blair.....                                          | Stormont.....          | 60       | ..   | 15          | 13   | ..  |
| Argonaut Mining & Milling Co. (A. Walton <i>et al.</i> )..... | Kemptville.....        | 685      | ..   | 460         | 2    | ..  |
| Brookfield Mining Co.....                                     | Brookfield.....        | 6475     | ..   | 4962        | 9    | 1   |
| Pictou Development Co.....                                    | Renfrew.....           | 594      | ..   | 1649        | 5    | ..  |
| Warwick Gold Mining Co.....                                   | ".....                 | 426      | 3    | 23          | 10   | 13  |
| John W. Lowe and others.....                                  | Whiteburn.....         | 189      | ..   | 70          | 15   | ..  |
| New Egerton Gold Mining Co.....                               | Fifteen Mile St'm..... | 2653     | ..   | 513         | 8    | ..  |
| Old Province Mining Co.....                                   | Wine Harbor.....       | 146      | ..   | 24          | 12   | ..  |
| J. J. Snook and others.....                                   | ".....                 | 710      | ..   | 117         | 18   | ..  |
| Plough Lead Mining Co.....                                    | ".....                 | 2783     | ..   | 877         | 2    | ..  |
| Royal Mining Co.....                                          | Fifteen Mile Br'k..... | 302      | ..   | 233         | 9    | 3   |
| Wm. Crook and others.....                                     | Lawrencetown.....      | 154      | ..   | 47          | 5    | 10  |
| Micmac Mining Co.....                                         | Leipsigat.....         | 1665     | 5    | 786         | 10   | 14  |
| Nova Scotia Gold Mg. & Dev. Co.....                           | ".....                 | 174      | ..   | 114         | 10   | ..  |
| John H. Anderson <i>et al.</i> .....                          | Lake Catcha.....       | 181      | 11   | 273         | 14   | 11  |
| F. W. Hanright <i>et al.</i> .....                            | ".....                 | 610      | ..   | 279         | 17   | 12  |
| Alex. McMillan <i>et al.</i> .....                            | Molega Barrens.....    | 119      | 11   | 224         | 19   | ..  |
| M. McMann and others.....                                     | Harrigan Cove.....     | 124      | ..   | 34          | ..   | ..  |
| St. Anthony Gold Mining Co.....                               | ".....                 | 1183     | ..   | 493         | 9    | ..  |
| Great Belt Mining Co.....                                     | Mt. Uniacke.....       | 2307     | ..   | 211         | 15   | ..  |
| Miller's Lake M. Co., and others.....                         | Miller's Lake.....     | 108      | ..   | 59          | ..   | ..  |
| A. K. Archibald <i>et al.</i> .....                           | Harrigan Cove.....     | 1'95     | ..   | 750         | ..   | ..  |
| Geo. E. Francklyn <i>et al.</i> .....                         | Montagu.....           | 100      | 10   | 39          | 17   | 11  |
| Miscellaneous.....                                            | Miscellaneous.....     | 170      | ..   | 77          | 6    | 18  |
| Mortared.....                                                 | ".....                 | ..       | ..   | 8           | 19   | 16  |
| Total.....                                                    |                        | 95827    | 5    | 31149       | 1    | ..  |

We give below the returns of the three principal producing companies, for a number of years:—

## BROOKFIELD MINING COMPANY, QUEEN'S COUNTY.

|           |       |       |    |       |    |       |      |       |      |      |        |
|-----------|-------|-------|----|-------|----|-------|------|-------|------|------|--------|
| 1895..... | 2,975 | ozs., | 11 | dwt., | 15 | grs., | from | 4,242 | tons | rock | milled |
| 1896..... | 4,667 | "     | 10 | "     | 15 | "     | "    | 5,315 | "    | "    | "      |
| 1897..... | 3,906 | "     | 18 | "     | .. | "     | "    | 9,712 | "    | "    | "      |
| 1898..... | 2,659 | "     | .. | "     | .. | "     | "    | 8,020 | "    | "    | "      |
| 1899..... | 3,125 | "     | 6  | "     | .. | "     | "    | 9,568 | "    | "    | "      |
| 1900..... | 3,083 | "     | 2  | "     | 13 | "     | "    | 8,939 | "    | "    | "      |
| 1901..... | 2,836 | "     | 18 | "     | .. | "     | "    | 7,515 | "    | "    | "      |
| 1902..... | 4,962 | "     | 9  | "     | 1  | "     | "    | 6,475 | "    | "    | "      |

## BLUENOSE GOLD MINING CO., SHERBROOKE.

|           |       |      |                  |      |        |      |      |         |
|-----------|-------|------|------------------|------|--------|------|------|---------|
| 1896..... | 432   | ozs. | (3 months' work) | from | 1,536  | tons | rock | milled. |
| 1897..... | 1,939 | "    | 13 dwt.,         | "    | 7,983  | "    | "    | "       |
| 1898..... | 3,664 | "    | ..               | ..   | 10,455 | "    | "    | "       |
| 1900..... | 4,218 | "    | I "              | ..   | 12,588 | "    | "    | "       |
| 1901..... | 4,201 | "    | ..               | ..   | 13,860 | "    | "    | "       |
| 1902..... | 2,391 | "    | ..               | ..   | 11,211 | "    | "    | "       |

## BOSTON-RICHARDSON GOLD MINING COMPANY, COUNTRY HARBOUR.

|           |       |      |                                 |       |    |      |      |        |      |      |         |
|-----------|-------|------|---------------------------------|-------|----|------|------|--------|------|------|---------|
| 1893..... | 2,237 | ozs. | 18                              | dwt., | 10 | grs. | from | 6,048  | tons | rock | milled. |
| 1894..... | 1,674 | "    | 10                              | "     | 10 | "    | "    | 7,016  | "    | "    | "       |
| 1895..... | 1,677 | "    | 7                               | "     | .. | "    | "    | 10,283 | "    | "    | "       |
| 1896..... | 2,550 | "    | (from 1st January to 31st Dec.) |       |    |      | "    | "      | "    | "    | "       |
| 1897..... | 3,004 | "    | ..                              | ..    | .. | ..   | from | 25,450 | "    | "    | "       |
| 1898..... | 2,478 | "    | 5                               | dwt., | .. | "    | "    | 24,121 | "    | "    | "       |
| 1899..... | 2,949 | "    | 10                              | "     | .. | "    | "    | 21,583 | "    | "    | "       |
| 1900..... | 4,779 | "    | ..                              | ..    | .. | "    | "    | 23,785 | "    | "    | "       |
| 1901..... | 3,279 | "    | ..                              | ..    | .. | "    | "    | 24,610 | "    | "    | "       |
| 1902..... | 3,408 | "    | ..                              | ..    | .. | "    | "    | 30,455 | "    | "    | "       |

## Mining in the North-West, 1902.

Mining in the North West Territories may be clearly divided into five districts, where mines are in operation, Canmore and Anthracite, Lethbridge, Souris, Edmonton and Blairmore.

Mining at Canmore is actively carried on all the year round, the output of coal being entirely consumed by the locomotives of the Canadian Pacific Railway. These mines have been in operation for over twelve (12) years principally by the one company the H. W. McNeill Co. with head offices at Anthracite, Alta.

No. 3 slope is sunk to a depth of 650 feet with workings mainly to the east over a mile in length. Within the past year a new underground slope has been sunk on No. 3 seam with cross-cut tunnels to No. 1 and 2 seams; the extra lift of coal thus gained will ensure a steady output from this mine for a number of years. Development work has also been pushed to the west of the slope, but troubled ground has materially hindered operations. About 2 miles to the east of No. 3 slope prospecting work is being done and the indications of a fairly large field are very hopeful.

At Anthracite, from which mine the hard coal consumers of the west depend entirely upon for their supply is at the present time crippled in its output, on account of the negotiations between the operating company and the owners of the adjoining property failing to agree on the point of royalty. The coal area owned by the present company operating is practically worked out but a favorable opportunity presents itself to bring the coal from the adjoining property out of the slope now in use. Should this slope be abandoned the cost of extracting the anthracite coal from the adjoining property, by driving a new tunnel to tap the seams, will be greatly increased to the operator or consumer. Lethbridge Mine which has supplied the wants of the North West Territories since the country first began to be settled, still holds the sway in the domestic coal market. The haulage roads extend for miles, radiating from the shaft in all directions to within 1000 feet of the working faces. This system of haulage is extended as the working faces advance and these extensions are in such a direction that the present shaft will be economically available for hoisting for many years to come. The mine although not tested to its full capacity last year, on account of a lack of cars, was producing in the height of the season over 900 tons per day.

Coal mining in south eastern Assiniboia has greatly benefitted by the coal famine in the Manitoba market, the output for the past year being more than double of any former year. There are three mines in operation, Roche Percee, Souris No. 1 and Souris No. 2 the latter producing the greatest tonnage with development work ahead capable of a production of 600 tons per day.

Edmonton coal mining like Edmonton real estate has taken an unprecedented boom, not unprecedented to the inhabitants of that city but certainly to the ears and eyes of the outside public. The whole surrounding country is underlaid by strata of coal varying from 2 feet to 12 feet in thickness. Altogether there are about thirty independent operators within a radius of twenty miles each of them producing from three to thirty tons per day. The coal is lignitic in nature, very suitable for domestic purposes and stationary boilers. The great stir in



railway circles is no doubt the cause of all this activity and as soon as a trans-continental road penetrates the country, these numerous small mines will be closed down and coal mining will be carried on more extensively by two or three companies operating large areas.

Blairmore coal mining district which has only been known as a coal producer for the past 18 months, has at the present time a larger output and more extended market than any other coal district in the Territories. The principal mine in operation is the Frank mine situated close to the town of Frank, Alta. Towards the end of 1900 this mine was opened and in less than two years the output has been increased to 75,000 tons. The peculiar conditions of this seam, (vertical) were conducive to the quick getting of coal and now that the development work is so far advanced the capacity of the mines is practically unlimited. The main tunnel has been driven over a mile in length straight into the mountain with rooms worked to the surface for nearly half that distance, over seventy per cent. of the coal still remaining in them. This coal can now be drawn at any time and the output is only curtailed by the means that the coal can be handled in the mine and at the tippie.

Another mine operated in this district is Gold Creek Colliery owned by the United Gold Fields Co. of British Columbia. A branch railroad seven miles in length has been completed to the mine but few shipments have been made. Many other prospects in this district are being developed and the quality of coal is similar in most cases. The only difficulty that exists in making this part of the country the largest producer in the Dominion is the means of transportation.

FRANK B. SMITH, B.Sc.,  
*Inspector of Mines.*

## MINING INSTITUTE

### Report of Council — New Officers and Council — Arrangements for the Annual Meetings.

On Wednesday, Thursday and Friday of next week, 4th, 5th and 6th March, the Canadian Mining Institute will hold its annual meetings in the Club Room, Windsor Hotel, Montreal. Business sessions will be held on Wednesday and Friday mornings and sessions for the presentation and discussion of papers on the afternoon and evening of Wednesday and Thursday, the closing session taking place on Friday afternoon.

Thirty-four papers by members and twelve papers by mining students are on the programme. Special arrangements having been made to carry members and mining men to these meetings at a single fare on all railways, the attendance promises to be large and representative.

#### NEW OFFICERS AND COUNCIL.

If the slate recommended by the Nominating Committee meets with approval, as seems likely, the following gentlemen will comprise the Board of Management for 1903-1904 :—

##### PAST PRESIDENTS

Mr. John E. Hardman, S.B., Mining Engineer, Montreal.  
Mr. S. S. Fowler, S.B., Mining Engineer, Nelson, B.C.  
Mr. Charles Fergie, Mining Engineer, Westville, N.S.

##### PRESIDENT

Mr. Eugene Coste, Mining Engineer, Toronto.

##### VICE-PRESIDENTS

Mr. John B. Hobson, Mining Engineer, Bullion, B.C.  
Dr. Frank D. Adams, McGill University, Montreal.  
Mr. Robert E. Chambers, Mining Engineer, Bell Island, Nfld.  
Mr. George R. Smith, M.L.A., M.E., Thetford Mines, Que.

##### SECRETARY

Mr. B. T. A. Bell, Editor *Canadian Mining Review*, Ottawa.

##### TREASURER

Mr. J. Stevenson Brown, Montreal.

##### COUNCIL

Mr. E. B. Kirby, E.M., War Eagle Con. Min. Co., Rossland, B.C.  
Mr. S. F. Parrish, Le Roi Mining Co., Rossland, B.C.  
Mr. J. H. Tonkin, Crow's Nest Pass Coal Co., Fernie, B.C.  
Mr. Frederic Keffer, M.E., B.C. Copper Co., Anaconda, B.C.  
Mr. A. P. Turner, Canadian Copper Co., Copper Cliff, Ont.  
Mr. E. A. Sjostedt, Con. Lake Superior Co., Sault Ste. Marie.  
Mr. D. G. Kerr, C. & M.E., Cordova Exp. Co., Cordova, Ont.  
Dr. W. L. Goodwin, School of Mining, Kingston, Ont.  
Mr. Harry J. Williams, New Eng.-Can. Asbestos Co., Thetford.  
Dr. J. Bonsall Porter, McGill University, Montreal.  
Mr. B. Bennett, King Bros. Asbestos Mines, Thetford, Que.  
Mr. F. Cirkel, Consulting Mining Engineer, Montreal.  
Mr. Cornelius Shields, Dominion Coal Co., Glace Bay, C.B.  
Mr. G. H. Duggan, C.E., Dom. Iron & Steel Co., Sydney, C.B.  
Mr. Thos. Cantley, Nova Scotia Steel and Coal Co., New Glasgow.  
Dr. E. Gilpin, jr., Deputy Commissioner of Mines, Halifax.

#### REPORT OF COUNCIL.

The following report speaks for itself concerning the admirable work done on behalf of the profession and industry of mining in Canada by the Institute during 1902-3 :—

The Council of the Canadian Mining Institute have pleasure in submitting the Fifth Annual Report on the proceedings of the Institute during the year 1902. It is with much satisfaction that they are able to state that the period under review has been one of increasing prosperity and progress in all the operations of the Institute.

##### MEMBERSHIP.

The growth of the membership and its distribution will be seen from the following comparative statement :—

|                           | 1898 | 1899 | 1900 | 1901 | 1902 |
|---------------------------|------|------|------|------|------|
| Nova Scotia.....          | 16   | 16   | 19   | 27   | 31   |
| New Brunswick.....        | 2    | 1    | 2    | 2    | 1    |
| Quebec.....               | 66   | 77   | 77   | 77   | 79   |
| Ontario.....              | 44   | 68   | 91   | 83   | 107  |
| British Columbia.....     | 42   | 65   | 72   | 67   | 72   |
| Manitoba.....             | ..   | ..   | ..   | ..   | 2    |
| Newfoundland.....         | ..   | 1    | 2    | 2    | 2    |
| Alberta.....              | 5    | 5    | 5    | 6    | 6    |
| Yukon.....                | ..   | ..   | ..   | 2    | 5    |
| Great Britain.....        | 4    | 9    | 7    | 12   | 14   |
| United States.....        | 11   | 17   | 26   | 30   | 36   |
| China.....                | ..   | 1    | 1    | 1    | ..   |
| Honolulu.....             | ..   | 1    | ..   | ..   | 1    |
| Spain.....                | ..   | 1    | 2    | 2    | 1    |
| Australia.....            | ..   | ..   | ..   | ..   | 1    |
| South Africa.....         | ..   | ..   | 3    | 4    | ..   |
| Alaska.....               | ..   | ..   | 1    | ..   | ..   |
| Mexico.....               | ..   | ..   | 1    | 1    | 1    |
| Labrador.....             | ..   | ..   | ..   | 1    | ..   |
| East Africa.....          | ..   | ..   | ..   | 1    | 1    |
| South America.....        | ..   | ..   | ..   | 1    | 1    |
| Students.....             | 2    | 15   | 14   | 12   | 92   |
|                           | 192  | 277  | 323  | 331  | 453  |
| Died during the year..... | 2    | 4    | 4    | 4    | 2    |

During the twelve months over seventy names were added to the list of active members, and in consequence of the affiliation of the Mining Societies of McGill and Queen's Universities, the student membership was also considerably increased, the number of students on our roll at present numbering ninety-two.

The migratory character of certain branches of the mining profession is well known, and we have, in consequence of mem-



bers leaving the country, again to report a number of resignations. A few names have also been removed for arrears of subscriptions.

#### OBITUARY.

It is with profound sorrow that the Council places on record the deaths of Captain Robert C. Adams, of Montreal, and Dr. A. R. C. Selwyn, of Vancouver.

Captain Adams was very well known to many of you as one of the founders and first presidents of the General Mining Association of the Province of Quebec, and later as a member of the Executive of the Federated Canadian Mining Institute which preceded our present organization. He was of an extremely lovable disposition, a man of high character, and, possessing considerable ability as a speaker and a writer, he was for many years a conspicuous figure at the meetings and conventions which, since 1889, have been held annually at this time of year in this room. He will long be remembered by the mining fraternity in Quebec for the keen interest he took in promoting any effort having for its object the welfare of the profession and industry of mining, and particularly for the splendid services which he rendered to the mining industries of Quebec at a time when their existence was threatened by ill-considered and repressive legislation.

Dr. A. R. C. Selwyn, C.M.G., occupied the honoured position of Director of the Geological Survey of Canada from 1869 to 1895, and at the time of his death was one of our honorary members. Although not so well known to the present generation of mining men, Dr. Selwyn, when Director of the Survey, accomplished much for the advancement of geological science in Canada, and his numerous published reports of his explorations and investigations have greatly extended our knowledge of the resources of the Dominion. At our last Annual Meeting the Institute gave testimony of its appreciation of Dr. Selwyn's services to Canada by the presentation of his portrait in oil to the Museum of the Survey at Ottawa.

#### MEETINGS.

The Annual Meetings of the Institute were held in this place in March. All the sessions were well attended, and much interest was taken in the papers and discussions.

Pursuant to a Resolution to form sections of the Institute at various mining centres, meetings were held in Kingston, Ont., at Sherbrooke, Que., and at Nelson, B.C., and branches organized at these points. Of these meetings the British Columbia one was particularly successful. A number of interesting and valuable papers were read, and many new members elected.

#### PUBLICATIONS.

During the year no less than fifty-one papers were presented by members, and of these forty-one were published in Volume V of the Journal of the Institute. This large, handsomely bound and profusely illustrated volume was issued to members in August, and will, it is hoped, be found to be a work of considerable service and value, not only to the members, but to the mining profession. Numerous copies were donated to the libraries of the principal mining, engineering and technical societies in Canada, Great Britain, South Africa, Australia, New Zealand, New South Wales, India and the United States. Indeed the demand for copies has been so great that our supply is completely exhausted, and in the future it will be necessary to provide for a very much larger issue.

The papers read before the British Columbia meeting have also been printed, and will be included in Volume VI.

The publication and distribution of so large a volume of our Transactions, and the heavy cost entailed by the redrawing and engraving of the numerous maps, plans, sketches and photographs which accompany it, together with the expense of printing and mailing several thousand copies of the papers in pamphlet form, has been aided very considerably by an increase in our grant

from the Dominion Government, obtained, we are pleased to say, through the generous consideration of the Hon. the Minister of the Interior, Mr. Sifton.

As our expenses of publication must naturally increase from year to year with the growth and advancement of the mining industries in Canada, the Council hopes that the Hon. Mr. Sifton, who is keenly alive to the importance and necessities of our mineral development, may be induced not only to renew the grant for the ensuing year, but to make it an annual one.

#### STUDENTS' COMPETITION.

Seven papers, four from McGill and three from Queen's, were contributed by student members in competition for the President's gold medal and the prizes annually offered by the Institute. Every one of these welcome contributions to our Transactions possessed merit, but they covered subjects so widely diverse in character that the sub-committee appointed by the Council to make the award had the greatest difficulty in arriving at a decision. Mr. C. V. Corless, who sent in a highly meritorious review of the geology and ore deposits of South Eastern British Columbia, withdrew his paper from the competition, and the awards were finally made as follows: President's medal to O. N. Scott, Listowel, Ont., for his paper describing "The Ore Deposits of Copper Mountain, Similkameen District, B.C." Cash prizes of \$25 each to Mr. H. W. DePencier, McGill, for his paper describing "Mine Timbering in the Old Ironsides and Knob Hill Mines," and L. P. Silver, Queen's, for his review of "The Sulphide Ore Bodies of the Sudbury Region."

With the object of remedying the difficulty of making these awards in the future, the Council recommend that in addition to the President's medal three cash prizes of a value of \$25 each be offered annually by the Institute for papers contributed in the following divisions:—

GROUP I—*Ore Deposits and Mining Geology.* The subject may be treated generally, or some particular district or single deposit may be discussed or described.

GROUP II—*Mining Practice.* Any and every branch of mining may be treated, such as pumping, hoisting, ventilation, timbering, ore extraction, development, etc., etc., or some particular method of mining, or some individual mine or group of mines, may be described or discussed.

GROUP III—*Ore Dressing and Metallurgy.* Any branch of ore dressing or metallurgy may be treated, as for example: Crushing, jigging, milling, concentrating, smelting, roasting, cyaniding, etc., or some particular plant may be described or discussed.

#### VISIT OF THE LAKE SUPERIOR MINING INSTITUTE.

In accordance with a Resolution passed at the Annual Meeting, an invitation was extended to the Lake Superior Mining Institute to join us in a meeting at Sault Ste. Marie, Ont., to be held in the month of August. The secretary of that society, however, wrote that arrangements had already been made for their summer meeting in 1902, but that if the invitation was kept open for 1903 a joint meeting might be arranged. It is, therefore, proposed to hold a meeting of the two organizations at Sault Ste. Marie in August or September, thereafter visiting the copper and iron mines of the vicinity and the copper-nickel mines at Sudbury. The Hon. the Commissioner of Crown Lands for Ontario has promised a grant of one thousand dollars to aid in making these meetings and excursions a success.

#### LIBRARY AND READING ROOM.

The Library and Reading Room has been kept open daily during the year, and has been largely used by members and by visitors seeking information concerning the mineral resources and mining industries of the country. The collection of works on mining, milling and metallurgical practice, books of reference,



exchanges from kindred societies, magazines and papers, maps, plans and photographs, have been considerably extended, and it will be necessary to provide another book-case for the accommodation of this now very valuable collection.

## FINANCES.

The audited statement of the Treasurer which will be submitted to you in detail at the annual meeting, shows our finances to be in an exceedingly satisfactory condition the cash balance on hand at 31st. January, the end of our financial year, amounting to \$1,632.49. As showing the growth of the Institute the following comparative statement of our receipts and disbursements will be of interest :—

|           | Receipts.  | Disbursements. |
|-----------|------------|----------------|
| 1898..... | \$2,674.67 | \$2,454.85     |
| 1899..... | 3,421.10   | 3,156.05       |
| 1900..... | 3,601.50   | 3,455.76       |
| 1901..... | 4,076.50   | 3,749.71       |
| 1902..... | 6,330.89   | 5,655.80       |

Submitted on behalf of the Council.

CHARLES FERGIE,  
*President.*

B. T. A. BELL,  
*Secretary.*

## Notes on the Gold Ores of Western Ontario.

By MR. CHARLES BRENT, Rat Portage.

The gold fields of Western Ontario are situated on what is regarded by geologists as the oldest portion of the earth's crust now exposed.

The formations are entirely Archean and are two in number viz. the Laurentian and the Huronian, the latter being subdivided into the Couchiching and Keewatin series. The term Laurentian is used by Canadian geologists to designate in a petrographical and structural sense the crystalline generally acidic granitic or gneissoid rocks underlying the Huronian.

The Huronian of Western Ontario in its lower series the Couchiching consists wholly of sedimentary shallow water deposits of clay and clayey sands now almost wholly converted into grey and brown gneisses and mica schists but in places being merely consolidated into sandstones showing little or no alteration.

The upper or Keewatin series is largely composed of eruptives and their products with important sedimentary deposits now occurring as conglomerates, quartzites grits, breccias, graywackes slates and limestones.

The lower Archean occurs in large isolated areas, more or less surrounded by the schists of the upper Archean the latter forming a rough net work around the Laurentian areas.

The Huronian series dip away at high angles in every direction from the Central Laurentian bosses forming synclinals between the granite areas and now showing sections by which the geological history of the region has been worked out.

The whole mass of the Western Huronian series was once floating on a viscous granitic magma which under the varying weights of the Huronian strata or from some deep seated internal force swelled up into great bubble-like domes allowing the floating strata to sink into the spaces between. As the domes pushed upward the surface strata were stretched, fissured, sheared and contorted according to their position with regard to the rising masses which by friction with the colder strata had their outer cooling surfaces drawn into a sort of rough parallelism with the shear planes of the outside rocks thus forming the gneissoid margins which almost invariably surround the granitic masses. At the same time the margins of the granite masses were affected by the contact with the basic schists becoming themselves more basic and darker in color. *Felsitic* dykes were at the same time injected into the fissures

of the Huronian formed by the stretching and fracturing of the colder rocks.

It must be supposed that these granitic magmas though possessing fluidity were only hydrothermally fused since all along the edges of the contact angular fragments and slabs of basic Huronian rock, readily fusible at the melting point of granite, at a dry heat; are found floated off into the granite with their edges not even rounded by the heat. Later bosses of finer grained granites break through both Laurentian and Huronian areas and throw out felsitic dykes into each formation. A still later eruption of very fluid felsitic matter which may have been formed by a sort of a liquation process from some of the older eruptions must be assumed to account for some of the fine grained felsitic dykes which occur occasionally along the lines of contact of the older formations and penetrate fissures of almost capillary fineness in these rocks.

From the great magnitude of these domes of granite and from the steep dip of their synclinal gneissoid margins which correspond to the dip of the Huronian formations lying on their sides, it may be inferred that these Archean mountains were comparable in height to the greatest elevations of the present day. Lawson estimates the thickness of the Huronian rocks at 50,000 ft. and it is thus probable that the summit of these oldest of earths' mountains rose many miles above the present level.

Dynamic disturbances of post Archean times have apparently been rare in this district and are confined to the injection of a few *diorite* dykes and the fissuring and faulting of the rocks in the immediate vicinity of these. It must not be assumed from this statement that there has been no movement in the rocks during post Archean times. The clastic character of the quartz in most of the ore deposits and the shattered pyrites, often of different ages, constantly occurring in the veins show that movements have taken place which however are probably rather of secular than of dynamic character.

By the process of denudation which culminated during the glacial epoch, these great elevations have been reduced to an approximately level plane lying about 1200 feet above sea level which presents at the present day a most interesting section through the base of this group of ancient mountains. This plane is diversified by numerous basins scooped out of the softer rocks, which are now occupied by the complicated lake system of the district.

It may be noticed that the chains of lakes conform generally to the strike of the Huronian rocks which is approximately that of the direction of the glacial flow.

Post glacial changes have been very slight over the entire region as is evidenced everywhere by the freshness of the glacial strata and by the existence all over the district of brightly polished surfaces of rock which are just as smooth today as they were when the retreating ice sheet left them bare to the sky. This brief review of the geological history of the district will serve to make plain many peculiarities of the ore deposits and ores of this oldest of all the Gold fields.

The disturbances of the Archean period alone are responsible for the general geological arrangements we find at the present day and also for the folding, shearing and formation of the fissures which by subsequent circulation of hot and cold waters have been filled with the quartz and other minerals which form the ore deposits of Western Ontario.

The levelling of the Archean mountains which took place through the long ages preceding the glacial epoch was completed during that period and the whole mass of decomposed material swept away to the south and west to be distributed over half a continent, leaving only the solid unaltered bases of the mountain group.

This sweeping away of the debris of ages has rendered the ore deposits of Western Ontario unique in many respects among which may be noted the following :—



1st. The general levelling has left no great elevations. There is consequently practically no post glacial drift and the ore deposits are in plain sight. What is practically a deep level section of the ore body is laid bare with all its characteristics and since it is axiomatic in mining that "as the length is so is the depth," the underground behaviour of these ore bodies can be predicted with almost absolute certainty.

2nd. The contacts between the granites and traps, as the Laurentian and Huronian formations are commonly called, are always in plain sight, and since it has been established by actual work that these contacts are in some way connected with the presence of gold in the ore-bodies in the vicinity a useful guide is always at hand in exploring new areas.

3rd. There is practically no surface decomposition or surface enrichment to be met with in the entire district. A few feet of sinking as a rule reveals the character of the ore and that character is maintained in depth.

4th. There is no "water level" such as is commonly met with in other mining districts below which decomposition ceases and the ore changes in character. If an ore is found to be "free milling" on the surface it will retain that character to an indefinite depth.

5th. The solidity of the rock in this district is such that very little timber is required and although shafts are commonly sunk for hundreds of feet within a few feet of the shores of great bodies of surface water no trouble has been encountered from an excess of underground water.

6th. The rocks of this district are the hardest known to the mining world and more steel is used both in mining and crushing than in any other part of the world.

7th. The absence of any considerable elevations and the consequent lack of rapid streams, coupled with the facts that there is no loose material except glacial drift, would seem to preclude the probability of any areas of placer ground being found unless the streams which must have flowed to the south from the retreating southern edge of the ice sheet during the close of the glacial period have concentrated the gold contents of some of the terminal moraines.

As have been mentioned above the most promising auriferous deposits occur on or near the contact of the Laurentian and Huronian formations but gold has been found as well in veins in granite areas far removed from any contact and benches and segregations of gold bearing quartz are found everywhere in the Huronian schists with no apparent connection with any later eruptive.

A number of interesting occurrences may be cited to show the wide spread diffusion of the precious metal in this district and the varying character of the auriferous deposits.

On Gold Brook, near the Mattawan River, a number of locations have been taken up on a band of fine grained gneiss with sparsely disseminated grains of iron pyrites which carries gold throughout from a trace to 500 per ton. This deposit is nearly half a mile wide and several miles long, and although the gold content is too low for profitable working the occurrence must be regarded as highly interesting from a theoretical standpoint.

At the Hammond Reef, a band of shattered granite with quartz filled seams has been found to carry a workable amount of gold over a width of 300 feet and a length of some miles.

On Shebandowan Lake a number of very coarsely crystalline dykes of porphyry carry from a trace to \$20.00 per ton.

On Eagle Lake a band of schistose granite thirty feet in width is being actively worked with satisfactory results.

A large number of locations have been taken up on felsite dykes, many of which carry gold *per se* as well as in the fissures now filled with quartz which were produced by the shrinkage of the dyke rock in cooling or by subsequent movements along the line of weakness which

caused the primary dyke fissure. Among these may be mentioned the Bully Boy on Camp Bay. The Champion, near Rat Portage, No. 2 vein at the Big Master, on the Manitou, and the Sakoose in the New Klondyke, all of which have proved to contain workable amounts of gold.

True Fahl bands or belts of schist impregnated with pyrite and other sulphides are unknown in the district but numerous bands of pyritous schist with intercalated seams of quartz are to be found in the country. These generally contain lenticular bodies and stringers of quartz and are rather to be regarded as bedded deposits although generally claimed as Fahl bands. Among this class may be cited the Scramble near Rat Portage, the Flint Lake on Flint Lake and the Little Bobs on Denmark Lake. Bedded or lenticular or segregated veins are the usual form of ore deposits in schistose rocks, and these occur in great variety in Western Ontario.

At the Sultana, a series of great lenses in sheared porphyritic gneiss have produced a large amount of gold. At the El Dorado, on Eagle Lake, a bedded deposit in sheared granite is being developed with satisfactory results. At the Big Master, a bedded vein in chloritic schist has produced a large amount of gold. The Gold Hill veins, the Black Jack and Golden Gate veins in Hornblende schist have been worked with satisfactory returns.

The Olive, in the Seine River District, lying in a bed of schistose diorite is also auriferous, has produced a good deal of gold.

The Golden Horn, on the Lake of the Woods, in chloritic schist, is being actively developed with satisfactory results. The Wendigo, on the Lake of the Woods, is working a bedded vein in a band of pyritous Hornblende schist which carries a workable amount of gold.

The Triggs, Reliance, Gold Panner, Virginia, Cameron Island, are among many others worked on bedded veins in schistose formations with more or less success.

So called true fissure veins are numerous in the granite areas, but as might be expected, are comparatively rare in the schist. The Ferguson, Foley and Lucky Coon on the Seine River, the Golden Eagle on Eagle Lake, and the Nino in the Deer Lake country may be cited as notable examples of this class of deposit in granite, and the pebble vein at Gold Hill Mine, and the Jubilee vein on the Manitou may be cited as examples of true fissures in schistose formations.

Of contact veins no typical examples have been worked, although many such are known. The Mikado vein and the Black Eagle each cross a contact between diabase and granite, and since by longitudinal faulting in each case, one wall of the vein is granite and the other diabase for a short distance, these veins are in part true contact deposits.

It may be noted as a curious feature that the richest ore in the Mikado vein lies in this zone of contact, while the leanest ore in the Black Eagle's lies in the corresponding position.

As to the primary source of the gold in these deposits, not enough data are at hand to enable one to generalize with any degree of certainty, but from the fact that many of the felsite dykes carry gold *per se*, and that no gold has been found in the Couchiching series and but rarely in the sedimentary members of the Keewatin, and that eruptive contacts have been proven to be favorable to the presence of gold, it would seem that the gold came up from deep seated sources both with the Huronian eruptions and the later Laurentian granites to be distributed in its present situations with the quartz and accompanying minerals by the circulation of water under unknown conditions as to time, temperature and pressure.

As to the character of the ore, it may be noted that in all classes of deposits the gold, whenever found in workable amounts, is invariably associated with quartz in some form, and with the sulphides of iron, copper, lead and zinc, and that no complex minerals, and but few rare minerals are present.



Gold, if present in workable amounts, is, to a great extent, "free milling" and it may be taken as an axiom in this district that if an ore does not show gold in the pan it is economically valueless.

As to associated minerals, it may be noted that *Iron Pyrites* occurs in every gold ore in the district, and that as an indicative mineral, it is valueless.

The same is true of *Pyrrhotite*, which is commonly abundant in the pyritous schists. When an ore contains "free" gold the iron pyrite invariably contains gold, the pyrrhotite almost never.

*Copper Pyrites* in the ores of the Black Jack, Wendigo, Mikado and Black Eagle is invariably associated with high values in gold, while in the ores of most of the other veins of the district its presence means nothing favorable or otherwise.

*Galena* is invariably associated with high values in gold in the Sultana, Mikado, Golden Horn, Golden Star, Olive, Foley, Champion, Treasure and Big Master mines.

*Zinc Blende* is of the highest value as an indicative mineral in the veins of this district and wherever quartz is found with disseminated zinc blende, it is safe to say it is rich in gold. The richest ore in the Foley, Golden Star, Olive, Sultana, Champion, Golden Horn, Sakoose and Big Master, as well as in the veins in Eagle Lake, is invariably associated with the sulphides of zinc and lead, although these minerals in most cases carry little or no gold *per se*.

The rare sulphide of Bismuth, Bismuthinite is abundant in the ore from the Mikado vein and is sparingly found in the other veins of the vicinity. It is invariably associated with high gold values in the Mikado vein, and possesses no significance in any of the other veins in which it occurs.

Mispickel, and Arsenical and Antimonial sulphides are rare, and traces only of tellurides are met with, the only exceptions being the Huronian vein in Moss Township which produced very fine specimens of sylvanite, and in the Gold Creek vein on the Lake of the Woods, which, in a narrow pay shoot, carries the rare silver telluride aessite.

Leaves of native copper are comparatively common in the gold ores of the district and particles of native silver and of native platinum have been found associated with gold in several veins on the Lake of the Woods. Molybdenite is commonly found in gold bearing veins but possesses no significance as an indicative mineral.

As indicative minerals, the sulphides range in value as follows: 1. Zinc Blende. 2. Galena. 3. Copper Pyrites. 4. Iron Pyrites.

As may be gathered from the foregoing notes, the gold ores of the district may be regarded as "free milling," and experience has shown that from 70 to 90 per cent. of the total gold contents of the ores may be obtained by simple battery amalgamation, and that a satisfactory percentage of the remaining values may be obtained by subsequent concentration and chlorination, or cyaniding, or by direct cyaniding without previous concentration.

The "free milling" character of the ore has been retained in depth, and from the considerations presented in these notes, it is to be expected that these characteristics will be permanent to any depth, and since from a geological standpoint there is no reason why the deposits themselves may not run to as great depths as are practicable to mine, it would seem that in spite of many disastrous failures up to date that as soon as the era of "wild catting" and stock jobbing schemes passes over that money and common sense will ultimately make a profitable, permanent mining industry in Western Ontario.

There is no district in the world where so many classes of gold bearing deposits may be met with as in this, and nowhere else is there such a wide spread diffusion of the precious metal, and although it is not to be expected that all of these gold deposits can be made to pay, it is to be expected that some of the best of them under the favorable conditions as to accessibility, climate, water, fuel and water power, may be made profitable mines when ample capital and experienced management are brought to bear upon them.

## The Development of Gold-Dredging in the United States.

By RALPH L. MONTAGUE, A. I., M. E.\*

Although gold-dredging had been carried on successfully on a moderate scale in New Zealand for a number of years, the efforts of American engineers were invariably met with failure when they tried to handle placer deposits by this method, and it was not until 1895 that the first successful dredge was built. Previous to this date various machines had been installed in different parts of the country, but from one cause or another they all failed. One fault common to nearly all these earlier types was that the machinery used was not powerful enough. In some localities, notably the Snake River, in Idaho, the gold was too fine to save in the appliances used; but the most common fault was that the final disposition of the tailings had not been taken into consideration, and consequently it was only a matter of time when the tailings crowded in on the dredge and work had to cease.

The first successful dredge in America was installed at Bannack, Montana, and commenced operations on the 19th June, 1895. In its earlier stages the management of this undertaking was in very inefficient hands, and this dredge would undoubtedly have been a failure if the management had been changed; but by judicious changes and additions to the machinery it became, as it is to-day, the most efficient dredge in the United States.

The most important points to be considered when selecting or designing gold-dredging machinery are:—First, the ability to handle a large amount of gravel economically, e.g., to excavate; secondly, to dispose of the tailings with the least expenditure of power; thirdly, to save the gold. I have put the gold saving problem last, because the most perfect arrangements for saving gold will be useless if a large yardage is not handled; and, furthermore, if a machine is capable of handling several hundred cubic yards in twenty-four hours some sort of device can be adopted that will save the gold.

The type of dredge that is so successful in America is, in its main features, totally different from the New Zealand type of machine. The gravel in place is excavated by an endless chain of buckets; in some instances the buckets are connected by links, in others the buckets are continuous. The upper tumbler which drives this chain of buckets is set about 14 ft. above water-level. The excavated gravel is dumped into a shoot that leads into a revolving screen or grizzly. This grizzly is placed with its lower end and projecting over the side of the boat, and the large boulders drop overboard, and are thus easily disposed of. The finer material that passes through the openings in the screen (these openings average  $4\frac{1}{2}$  in. square) falls into a sump, and a centrifugal pump picks up this gravel, together with the water necessary to sluice it, and elevates it into a sluice-box, which is supported on a auxiliary flat boat at the stern of the dredge. It is not necessary to have the upper end of the sluice box over 20 ft. above water-level; the average height taken from a number of dredges operating in various localities is 15 feet.

This type of dredge, instead of being held in position by a series of wire cables, is held by means of a "spud" or anchor, which consists of a timber shod with a steel shoe, or, as is the case in some places, the spud is made up of sheets of steel and channels, I beams, &c. The digging is performed by starting the bucket-chain on one side of the face of the cut and moving slowly across the face. As the dredge is pivoted on a spud at the stern, only one line is needed to swing the dredge. When the other side of the face is reached the ladder supporting the bucket-chain is lowered and the dredge swung slowly back, thus taking off another cut. This process is kept up until the bed-rock is reached; then the dredge is moved up towards the face, and the process is repeated. There are several advantages in this method of

\*London Mining Journal.



digging that appeal to a practical man. One point is that the cut is dug out clean, it being impossible to leave any gravel behind. Then, again, the dredge being held steady by the spud, there is practically no surging backwards and forwards of the dredge, as is the case with dredges that are only held by cables. This side-feed makes it easier to keep the buckets full continuously, and, furthermore, cleans bed-rock better than any other method of digging. The only parts of this dredge that are brought in contact with the gravel are the bucket-chain, the revolving screen, and the centrifugal pump.

The upper end of the sluice-box rests on a turn-table, the base of which is supported on the dredge; and a short length of special hose connects the end of the discharge-pipe from the centrifugal pump with the sluice. By this means a flexible connection is formed between the dredge and the sluice-box. The lower end of the sluice can be swung into any position, and thus the accumulation of tailings can be regulated and spread evenly across the pit.

A further advantage of this method of dredging is, that the coarse material being on the bottom and the fine material running on to it, it fills up all the spaces between the boulders and thus packs the tailings well down. The actual space occupied by tailings from a cut the average depth of which was 35 ft. was 38 ft.

A properly designed sluice-box boat will have 50 ft. clearance between the dumping end of the sluice and the stern of the auxiliary flat boat which supports it. This insures against the tailings crowding in and grounding the sluice-box boat.

#### COMPARISON OF TYPES.

I now propose to draw a comparison between the new American type of gold dredge and the New Zealand type.

As before stated, the New Zealand type is held in position by a series of cables. A headline extends out in front, and is supposed to keep the dredge up against the face of the cut. There are, furthermore, two sets of lines on each side, a pair of bow lines and a pair of stern lines, which serve the purpose of swinging the dredge across the face of the cut. The advocates of the New Zealand type admit that the American type is the best dredge for digging purposes; and any practical engineer can see for himself that it is easier to dig from a steady platform (the American type) than from a swinging platform (the New Zealand type). The upper tumbler of the New Zealand dredge is set about 22 ft. above water-level. The excavated material is dumped into a revolving screen with very fine openings. The screened material is carried over a set of gold-saving tables, extremely limited as to size, and then elevated by means of a centrifugal pump. The coarse material that comes out of the lower end of the grizzly is elevated by means of a secondary chain of buckets to a point about 24 ft. above water-level. While it is true that it is not necessary as a rule to run the centrifugal pump that lifts the fine material from the gold-saving tables continuously, we can safely say that this pump is run half the time.

I will now compare the work done by the two different types of machines.

The American type lifts 100 per cent. of the material 14 ft. above water-level, and after screening lifts, say, 60 per cent. 15 ft. above water-level. The New Zealand type lifts 100 per cent. of the material 22 ft., and after screening lifts 60 per cent. 24 ft. and 40 per cent. 24 ft. for half the time. The ratio of power expended in lifts alone is 23; 42.2.

In the American type I have put the screened gravel at 60 per cent. of the whole, and as the openings in the screen of the New Zealand type are so much smaller I have put this dredge's screened material at 40 per cent. of the whole. (Note,—The smaller this percentage is the more unfavorably does the ratio work out).

From actual appearance I find that an American type dredge with a chain of buckets of 5 cubic feet capacity will excavate and sluice on

an average 2,300 cubic yards per day of twenty-four hours. The indicated horse-power of this dredge was 120. This dredge was driven by electric motors, and the instruments used to measure the power were made by a first-class firm, viz., the Weston Instrument Company, Newark, N. J. This works out at about 19 yards per horse-power per day. The work done by the New Zealand type I cannot state from actual experience, but taking the figures that have been given me by the advocates of this type, viz., 50 horse-power for a 3 ft. bucket dredge—the capacity is 600 cubic yards per day on an average. This works out at 12 cubic yards per horse-power per day. In buying electric power by meter rate we will presume that a unit of horse-power costs £1 (\$5) per month. The wages we will put at 10s. per day unskilled, and 14s. and 16s. per day for skilled labour.

The American type will need per-shift of eight hours one operator at 16s., one machine-tender at 14s., and one deck-hand 10s. The New Zealand dredge will need one operator at 16s., and one deck-hand at 10s. The total wages and power bill per day will be: American type, wages, £6; power, £4 per day; total, £10 per day. The New Zealand dredge wages, £3 18s.; power, £1 13s. 4d.; total, £5 11s. 4d.

| Type.          | Wages. |    |    | Power. |    |    | Total. |    |    | Capacity<br>Cu. Yds. | Cost per<br>Yard. |
|----------------|--------|----|----|--------|----|----|--------|----|----|----------------------|-------------------|
|                | £      | s. | d. | £      | s. | d. | £      | s. | d. |                      |                   |
| American.....  | 6      | 0  | 0  | 4      | 0  | 0  | 10     | 0  | 0  | 2,300                | 1.04              |
| New Zealand... | 3      | 18 | 0  | 1      | 13 | 4  | 5      | 11 | 4  | 600                  | 2.03              |

Obviously, the American type of dredge can handle ground more economically than the New Zealand type. When we go into the cost of repairs the comparison is still more unfavorable for the New Zealand type.

In drawing these comparisons I have had, on one hand, my own experience as the source of my figures; but, on the other hand, I have had to take figures of those who were interested in the New Zealand type of dredge.

In regard to the gold-saving efficiency of the American type of dredge, in localities where the gold is coarse no difficulty is experienced, and in other places where finer gold is met with the introduction of under currents in the sluice, and other devices has successfully accomplished that end.

#### DREDGING IN UNITED STATES OF AMERICA.

I will now give a brief history of some of the undertakings in the United States.

The first dredge was owned by the Gold Dredging Company. Another Company, the Bannack Dredging Company, built a dredge on the claims adjoining and were very successful. Further down the stream an English company, the Bon Accord Company, built a very large dredge, and failed through bad management. Below this dredge another company built a dredge and was successful. All these dredges were the American type. In 1897, the Bed-rock Dredging Company commenced operations in the Boise Basin, Idaho; the Basic Company and the Bullion Company likewise commenced, but one and all failed, solely owing to bad management. One of these companies, viz., the Basic Company, has been reconstructed, and is successful. The Pacific Dredging Company, at Moose Creek, Idaho, was started in 1898, and is a successful enterprise. At Breckenbridge, Colorado, three New Zealand type dredges were built, but were failures, owing to the nature of the ground. An American type has since been installed, and is in successful operation.

In California there are a number of New Zealand dredges working successfully. At Oroville, in 1900, an American type dredge was installed. This dredge had a continuous chain of 5 cubic feet buckets and was capable and has averaged 3,200 cubic yards per day; but owing to very poor management the machinery was allowed to wear out and the undertaking became a failure. This dredge has been remodelled, and the capacity has been cut in half; but as the dredge



has been broken down almost continuously since it was restarted it has, for dividend paying ability, practically no value.

The reason why there are so many failures of dredging undertakings is because it is a new method of placer mining, and it seems so simple at first that after a man has seen one dredge for a few minutes he imagines he knows all about it. American mining companies are, as a rule, close corporations, and frequently family affairs too. The wish to put some relative in the position of manager is frequently gratified, but at the cost of the success of the undertaking.

Then, again, a mining engineer who has been successful in some other branch of mining is engaged to manage a dredging plant. Sometimes he is willing to admit that he has a lot to learn, but as a rule he imagines he can teach others who have spent more years dredging than he has weeks. The writer can remember one case in particular, where a young graduate from college became filled with the idea, after having seen a few dredges, that he could design the most up-to-date dredge in existence. He designed a dredge that was a combination of the American and New Zealand types. Instead of elevating his screened gravel into a sluice he used tables. He held his dredge with a spud, which was all right for digging, but as he endeavored to dump his fine material back into about one-fourth the space it occupied originally he had trouble. Another mistake he had made was to dump his excavated material on to grizzly bars placed about 6 inches apart. As long as nothing but fine gravel was dumped on the bars they did not choke up, but as soon as stones fell on the bars they would not pass through, they stuck, and more gravel and stones falling on top simply wedged them in all the firmer. He had put on a chain of close connected buckets of 3 cubic feet capacity. In digging ground that has any large sized stones it is impossible to keep such buckets full, as the pitch is only 24 in. If a large amount of gravel must be handled, put on 5 ft., 7½ ft., or 10 ft. close connected, but not 3 ft., 5 ft. close connected buckets is the smallest practical size. Of course, an open connected chain with 3 ft. buckets can be kept full, because the pitch then between the buckets is 48 in. Another mistake made in this design was in the horse-power of the motors. I was asked to give an opinion on the design, and did so; but every change I suggested was met with the statement that it had been all figured out, and the dredge would work well. However, a company was formed by the young man's father, and the dredge was built. It worked exactly as had been foretold, it will excavate just about twice as much gravel as can be washed and disposed of, so that the buckets have to be run as slowly as possible in order to allow the tables to be kept from packing with sand, and to give the stacker and centrifugal pump time to get away with the tailings.

There is one other type of dredge that deserves a certain amount of notice. It is a shovel dredge. This type is to be avoided for placer mining, because it is the most costly to work and the most inefficient all round. A comparison of the different types mentioned in this article in a handy form is as follows:—

| Type.      | Size Buckets.      | Horse Power. | Average Capacity. | Yds. per Horse power |
|------------|--------------------|--------------|-------------------|----------------------|
| Am.....    | 5 cubic feet o. c. | 120          | 2,300             | 19                   |
| N. Z.....  | 3 cubic feet o. c. | 50           | 600               | 12                   |
| Am.....    | 5 cubic feet c. c. | 170          | 3,200             | 18.8                 |
| Am.....    | 3 cubic feet c. c. | 140          | 800               | 5.7                  |
| Shovel.... | 1¼ yards           | 160          | 500               | 3.1                  |

There is one dredge that should not be missed, viz., a 7½ ft. close connected Am. type. This dredge is at Folsom, California, and has not, as far as I can learn, met with brilliant success, although it does not come under the head of failure. This dredge achieved the distinction of handling, in one day of 24 hours, over 7,000 cubic yards; but owing to the nature of the ground, which has a layer of large boulders just above bed-rock, there was a bad breakdown in the machinery, and the machine was idle for six months after making this record

### The Sultana Ophir.

The Crown Lands Department has at last finally disposed of the contest as to the Ophir Mine on Sultana Island. This property has been in dispute and litigation since 1886.

The Ontario Mining Company was formed under a Dominion Charter to acquire the property and Dominion mining regulations were passed for the purpose of enabling the Dominion Government to deal with the matter. Under these regulations three patents were issued by the Dominion Government to H. G. McMicken, A. C. McMicken and George Heenan, who assigned to the Ontario Mining Company, as also did the applicants to the Dominion Government for the balance of the Island excepting the Caldwell Mine.

A Timber license had, however, been previously issued giving exclusive possession of Sultana, among other Islands, to the Timber Licensees.

When the Ontario Mining Company gave a working option upon the property the proposed purchasers were at the instance of the Timber Licensees restrained by injunction from working the property. This litigation was, however, ultimately settled.

Meantime applications had been put into the Ontario Government, it being claimed that the Dominion Government had no jurisdiction over the property and the contest was transferred to Ontario where it was carried on with increased bitterness for a number of years. At one of the hearings 13 Counsel appeared on behalf of various applicants. At the conclusion of protracted hearings the Ontario Government ruled that a one-third interest in the property should go to the Ontario Mining Company provided they abandoned all further claim and that the remaining two-thirds interest should go to Mr. E. Seybold and the other adverse applicants. The Ontario Mining Company refused to comply with this condition and attacked the patents by the Ontario Government of the two-thirds interest to the Ontario Patentees. This litigation went to the Judicial Committee of the Privy Council, the highest Court in the Empire, who decided against the contentions of the Ontario Mining Company and upheld the Ontario Patents. The fight was then renewed as to the remaining one-third interest but the patent has now been issued for this third interest to the Sultana Ophir Mining Company, Limited, a company organized under an Ontario charter by Mr. Seybold and to which he transferred his interest in the property. The result is that the Ontario Mining Company have no interest in the property and have been adjudged liable for the costs of the litigation and of the various appeals.

In the contest in the Crown Lands Department the Hon. S. H. Blake, K.C., appeared for the Ontario Mining Company, and Mr. J. M. Clark, K.C., as leading Counsel for Mr. Seybold, who succeeded.

The Granby smelter in one week recently treated 10,115 tons of ore, which is so far the record for Canada.

**Cariboo-McKinney.**—At the annual meeting of the shareholders of this company held at Toronto on 3rd instant the Directors reported that during the past year they had been able to declare dividends aggregating 4 per cent. while maintaining a reserve of \$50,000 for future contingencies. There was mined and milled during the year 11,414 tons of ore from the Caribou claim, 4,100 tons of ore from the Okanagan claim, 100 tons of ore from the Saw Tooth claim, a total of 15,614 tons. The average value of the ore mined and milled was \$9.96 per ton, 69.8 per cent. of this value or \$6.95 per ton was extracted as free gold by amalgamation, 17.4 per cent of the value, or \$1.74 was extracted and obtained in the concentrates, and the remaining 12.8 per cent. of the value, or \$1.27 per ton was lost in the tailings. While no unusual development work was done during the year, yet sufficient was done to keep ore reserves opened up well in advance of the stopes; during the year 1,040 feet of drifts were run, and 190 feet of upraises made.



## FAKE MINING MEETING.

**Standard Mining Exchange Hold a Convention of Alleged Ontario Mining Men and Railroads a Number of Resolutions Affecting Mining.—A Lively Session.**

What purported to be a meeting of the mining men of Ontario was held in the Board of Trade, Toronto, on Tuesday and Wednesday, 17th and 18th instant. The meeting was convened and held under the ægis of the Standard Mining Exchange and the bulk of the attendance consisted of people whose interest in mining was rather of the speculative than industrial character. Out of the forty persons present there were brokers, vendors of cheap mining stocks, company promoters, one or two lawyers, the legal fraternity as usual doing most of the talking, and a representation of three members from the staff of the Ontario Bureau of Mines, present, doubtless out of curiosity, for they took no active part in the proceedings. The only real mining men present comprised a couple of prospectors and Messrs. A. P. Turner and Major Leckie of the Canadian Copper Co., Mr. Joseph Errington of the Massey Station Mining Co., Mr. Eugene Coste, President-elect of the Canadian Mining Institute, and Mr. B. T. A. Bell, Secretary of the same organization. The copper and nickel people, we suspect, were present to safeguard the interests of their companies and to block any attempt to put through resolutions favoring a resurrection of the proposal to put an export duty on nickel.

Mr. James Conmee, M.L.A., was moved into the Chair and the meeting proceeded to find out "where they were at." Figuratively speaking, everyone present resolved himself into a point of interrogation and desired to know first, why the meeting had been called, secondly, who had called it, and thirdly, what was it all about. Mr. W. J. Elliott a barrister of Toronto pleaded guilty to the offence of calling the meeting but he did not venture to explain why it had been called or what it hoped to accomplish.

Mr. CONMEE stated it had been called in the name of the Standard Stock and Mining Exchange, the objects generally being to consider the present condition of the mining industry and to suggest any means for furthering its interests. He then nominated a committee on Credentials comprising: Messrs. D. F. Burke, Port Arthur, D. O'Connor, Sudbury, G. T. Marks, Port Arthur and D. G. Lorsch, Toronto. As nobody appeared to have any credentials the committee reported amid some amusement that everything was just and regular.

Mr. B. T. A. Bell, Secretary of the Canadian Mining Institute took occasion to point out that the persons present were not in any sense representative of the mining industries of the Province and anything done by the meeting could not be seriously regarded as being the opinion of the mining men. The condition of the mining industries was eminently satisfactory, the value of the mineral production in 1902 being about two millions of dollars better than in 1901, and much work was being done in the opening of new mines and mineral-bearing territory. So far as he knew there was absolutely no complaint about the mining laws which were in the main fair and equitable.

Mr. JAMES CONMEE, M.P.P., resented Mr. Bell's imputation that the meeting was not a representative one. He claimed that, in his experience, it was the best meeting ever held in Ontario. He then nominated the following as a committee on Resolutions: Messrs. B. T. A. Bell, Ottawa, D. M. Brodie, Massey, J. Errington, Massey, R. McKay, barrister, Sault Ste. Marie. This committee met with approval and having withdrawn to consider what business should be brought before the convention the meeting adjourned until ten o'clock next morning.

### WANT FREE COAL.

When ten o'clock came next morning only a corporal's guard was present and it was nearly an hour later before there was a sufficient attendance to warrant going on with the business. About thirty persons, including the representatives of the Toronto press, were present. The first resolution presented asked that the Ontario Government should memorialize the Dominion Government to take the duty off coal. It was as follows:

"Whereas the Province of Ontario is almost entirely dependent upon foreign coal as a source of power, and the mining and other industrial interests of the Province are unable by reason of our distance from the mines to purchase Canadian coal at any but prohibitive prices, and the present duty on foreign coal is a direct burden upon the mining, metallurgical and indus-

trial interests, and in no way extends the use of Canadian coal in Ontario; resolved, that the present duty on bituminous coal should be repealed, and that this convention use every means in its power to procure from the Dominion Government the repeal of the same, so long as the United States withholds its import duty."

Mr. B. T. A. BELL opposed the resolution on the ground that free coal would injure the Upper Canada market for Nova Scotia coal. That Province had produced in 1902 about five millions of tons of bituminous coal the great bulk of it having been disposed of in Canada as far west as Ottawa. He was strongly in favor of a policy which would build up and develop a national mining industry and if the duty was removed American collieries, owing to their extremely low mining costs, would be in a position to oust Nova Scotia coal from the St. Lawrence trade. He was in favor of a resolution asking the Dominion Government to lengthen and deepen our canals, so that Nova Scotia coal could be carried into Ontario as far west as Port Arthur, thus opening up the possibility of return cargoes of Ontario's iron ores to Nova Scotia steel works. If these locks were extended a large and valuable interprovincial trade in coal and iron could be built up.

Mr. D. F. BURKE, (Port Arthur) supported Mr. Bell. The Dominion Government he said should be asked to deepen the canals to sixteen feet and lengthen the locks to admit large vessels. The development of an interprovincial trade in coal and iron would be of immense benefit to Ontario.

Major LECKIE said he could not support the resolution as free coal would necessarily affect very seriously the coal mining industries of Nova Scotia and New Brunswick.

Mr. A. P. TURNER was in favor of the resolution which meant much for not only the mining and smelting industries of Ontario but for the great manufacturing interests of the Province. It would mean to his company, the Canadian Copper Company, a saving of many thousands of dollars annually.

Messrs. Conmee, McKay (Sault Ste. Marie), Saw and others having spoken in support of the motion it was put to the meeting and carried.

Resolutions affecting the location of mines upon timber limits and asking for the division of the Province into properly constituted mining divisions were adopted.

### WANT A MINISTER OF MINES.

Then came the *piece de resistance*, a resolution asking for the appointment of a Minister of Mines. The resolution read:—

Whereas, there has been a large increase and steady development of the mining industry in the province, and at the present time the Department of Crown Lands has the entire control thereof and the numerous duties incumbent upon the said Crown Lands Department have now grown to be of such magnitude that the establishment of a department dealing exclusively with mining and mining interests would greatly relieve the present pressure upon the Crown Lands Department, tending to relieve the congestion of business there, and thus largely facilitate the progress of development of the mining industry of the province; resolved, therefore, that a separate department in the Government should be established and a Minister of Mines appointed.

Major LECKIE said that the Mining Laws of the Province were, taken as a whole, all right but the administration of them, in his experience of the Department of Crown Lands, was far from satisfactory. He was not in favor of a new portfolio—it would be much better to expend the money upon increasing the efficiency of the Bureau of Mines. A competent mining engineer should be appointed at a good salary in a manner similar to that adopted in Nova Scotia and British Columbia.

Mr. B. T. A. BELL paid a high tribute to Professor Miller who had been appointed Provincial Mineralogist to the Bureau. Mr. Gibson, the present director of the Bureau, was also a most able and efficient officer. The question of the appointment of a new department was a rather large order and while, to some extent, he might be said to be in favor of it, the meeting was not a representative one and it would be most advisable to have it discussed by a larger and more representative meeting of the mining men of the Province.

Mr. JAMES CONMEE, having left the Chair, addressed the meeting strongly in favor of the appointment of a Minister of Mines. He maintained that the business of the Bureau of Mines was increasing so rapidly and the mining industries of the Province were attaining such value and importance that a new Department was an urgent necessity.

Mr. J. ERRINGTON complained of the loose methods of registering mining claims and he thought the Bureau of Mines should properly equip



its Provincial offices so that an applicant for a claim should know at once whether the claim was open and not already taken up.

Mr. JOHN MCKAY (Sault Ste. Marie) said that the Director of the Bureau of Mines was a capable, energetic officer, most upright in the discharge of his duties. The growth of mining in the Province fully warranted a department of mines separate and distinct from the Crown Lands Department.

Major LECKIE—"I have not been half so emphatic in my condemnation of the Crown Lands Department as some who have just spoken."

Cries—"No, No!"

"Why not take the office of Mining Minister yourself?" asked Mr. Elliott.

Major LECKIE—"I am no politician. You have been active in bringing supporters of the Government here."

"Order, Order!" from the chair.

Major LECKIE—"This isn't a representative meeting. Where is the East? I do not see anyone from Hastings County or the other active mining districts."

Mr. CONMEE again spoke of the resolution and denied that in anything he had said he had condemned the present Commissioner of Crown Lands.

Mr. EUGENE COSTE—"The question implies a change in the administration. This meeting is a farce. We are not representative."

Mr. B. T. A. BELL—"I quite agree with Mr. Coste—this meeting is anything but a representative one and I am in favor of postponing further discussion until a better meeting can be got together. As it is near the lunch hour I move therefore that this meeting do now adjourn."

Major LECKIE seconded the motion. "I submit that Ontario, Northern Ontario, at least, is not represented. As for the West, I am not qualified to speak. Many representative mining men are not here."

Mr. COSTE—"I claim that this is not a representative body. No one saw yesterday's credentials; they were whitewashed. Matters were railroaded through."

Chairman CONMEE—"Order, Order! I shall not permit you to say so." (Uproar.)

Mr. COSTE persisted and Mr. Conmee again ordered him to sit down.

Mr. COSTE then claimed the right to speak to Mr. Bell's amendment.

Chairman CONMEE—"This convention was advertised in the papers and I contend that this is a representative mining meeting."

Mr. BELL pressed his motion.

Mr. CONMEE—"It's not before the meeting."

Mr. BELL—"It is always in order to consider a motion to adjourn. I move that we now adjourn."

Mr. CONMEE—"If that is passed you burst all these resolutions."

Mr. BELL'S motion was put and lost.

The remaining resolutions were passed and a committee selected to wait on Premier Ross.

## Coal and Iron Returns 1902.

### Inverness Railway and Coal Company.

The following returns have been received since our last issue.

|                    |             |
|--------------------|-------------|
| Output 1st Quarter | 6,742 tons. |
| 2nd "              | 16,927      |
| 3rd "              | 14,655      |
| 4th "              | 30,182      |
|                    | 68,506      |

### Cape Breton Mining Company.

|                      |             |
|----------------------|-------------|
| To Quebec            | 1,718 tons. |
| Nova Scotia          | 3,719       |
| Newfoundland         | 2,134       |
| P. E. Island         | 504         |
| New Brunswick        | 126         |
| Other Countries      | 1,554       |
| Colliery Consumption | 3,083       |
| Colliery Employees   |             |
| Total                | 12,838      |

### Cumberland Railway and Coal Company.

|                |               |
|----------------|---------------|
| To Nova Scotia | 103,339 tons. |
| New Brunswick  | 171,602       |
| Quebec         | 48,713        |
| United States  | 112,123       |
| Total          | 435,777       |

### Intercolonial Coal Mining Company.

|                          |                 |
|--------------------------|-----------------|
| To Nova Scotia           | 86,083.08 tons. |
| New Brunswick            | 9,941.05        |
| P. E. Island             | 20,502.00       |
| Quebec                   | 74,593.06       |
| Coke ovens               | 8,108.00        |
| Ontario                  | 930.03          |
| Colliery employees       | 4,018.18        |
| Colliery engines         | 15,762.00       |
| United States            | 430.00          |
| Total                    | 220,369.00      |
| Coke made 1902           | 4,685 tons.     |
| Total Coal raised        | 216,180         |
| shipped (rail and water) | 191,560         |

### Canada Coals and Railway Company.

|                  |              |
|------------------|--------------|
| To New Brunswick | 28,994 tons. |
| Nova Scotia      | 3,847        |
| Quebec           | 7,545        |
| Employees, &c.   | 12,223       |
| Total            | 52,609       |

### Hamilton Steel and Iron Company.

|                   |              |
|-------------------|--------------|
| Canadian Ore used | 76,222 tons. |
| Foreign Ore used  | 33,914       |
| Cinder            | 12,285       |
| Flux used         | 32,665       |
| Pig Iron made     | 69,123       |

### Deseronto Iron Company.

|                    |                 |
|--------------------|-----------------|
| Canadian Ore used  | 1034—1260/2240  |
| Foreign Ore used   | 16568—1460/2240 |
| Charcoal Iron made | 9727—1350/2240  |

### Nova Scotia Steel and Coal Company.

#### COAL DISPOSALS.

|                                         |               |
|-----------------------------------------|---------------|
| Shipped                                 | 176,238 tons. |
| Intercolonial Railway use               | 6,466         |
| Local sales                             | 7,701         |
| Workmen at the Colliery, &c.            | 7,342         |
| Coal gifts to widows                    | 223           |
| Colliery use, engines, locomotives, &c. | 19,839        |
| Sundries (coke ovens and washers)       | 39,062        |
| On hand                                 | 1,586         |

Total coal raised..... 258,457

### Nova Scotia Steel and Coal Company.

#### IRON AND STEEL OUTPUT.

|                                 |        |
|---------------------------------|--------|
| Nova Scotia ore used at Ferrona | 13,389 |
| Wabana hematite (Newfoundland)  | 30,665 |
| Limestone quarried              | 20,145 |
| Coke made at Ferrona            | 6,731  |
| " " " Sydney Mines              | 25,932 |
| Pig iron made                   | 23,034 |
| Steel ignots made               | 17,907 |

### Canada Iron Furnace Company.

#### MIDLAND FURNACE.

|                   |                                        |
|-------------------|----------------------------------------|
| Canadian ore used | 17,404 <sup>1188</sup> <sub>2000</sub> |
| Foreign " "       | 41,608 <sup>1324</sup> <sub>2000</sub> |
| Flux charged      | 25,782 <sup>2855</sup> <sub>2000</sub> |
| Pig iron produced | 29,170 <sup>1827</sup> <sub>2000</sub> |

#### RADNOR PLANT.

|                         |                                            |
|-------------------------|--------------------------------------------|
| Ore mined               | 7,115 <sup>1805</sup> <sub>2240</sub>      |
| " purchased             | 5,725 <sup>1195</sup> <sub>2240</sub>      |
| Charcoal made           | 686,614 bushels.                           |
| Charcoal iron made      | 5,561 <sup>160</sup> <sub>2240</sub> tons. |
| Ore charged             | 14,170 <sup>1810</sup> <sub>2000</sub> "   |
| Fuel " bushels charcoal | 686,520                                    |
| Flux " "                | 1,256 <sup>1030</sup> <sub>2000</sub> "    |

### H. W. McNeil Co.

|                                 |        |
|---------------------------------|--------|
| Tons raised Anthracite Colliery | 16,550 |
| " " Canmore "                   | 91,400 |

### Alberta Railway and Coal Co.

|                     |         |
|---------------------|---------|
| Tons raised in 1902 | 153,704 |
|---------------------|---------|

### Crow's Nest Pass Coal Co.

|                     |         |
|---------------------|---------|
| Tons raised in 1902 | 393,961 |
|---------------------|---------|

### Canadian American Coal and Coke Co.

|                     |        |
|---------------------|--------|
| Tons raised in 1902 | 75,000 |
|---------------------|--------|

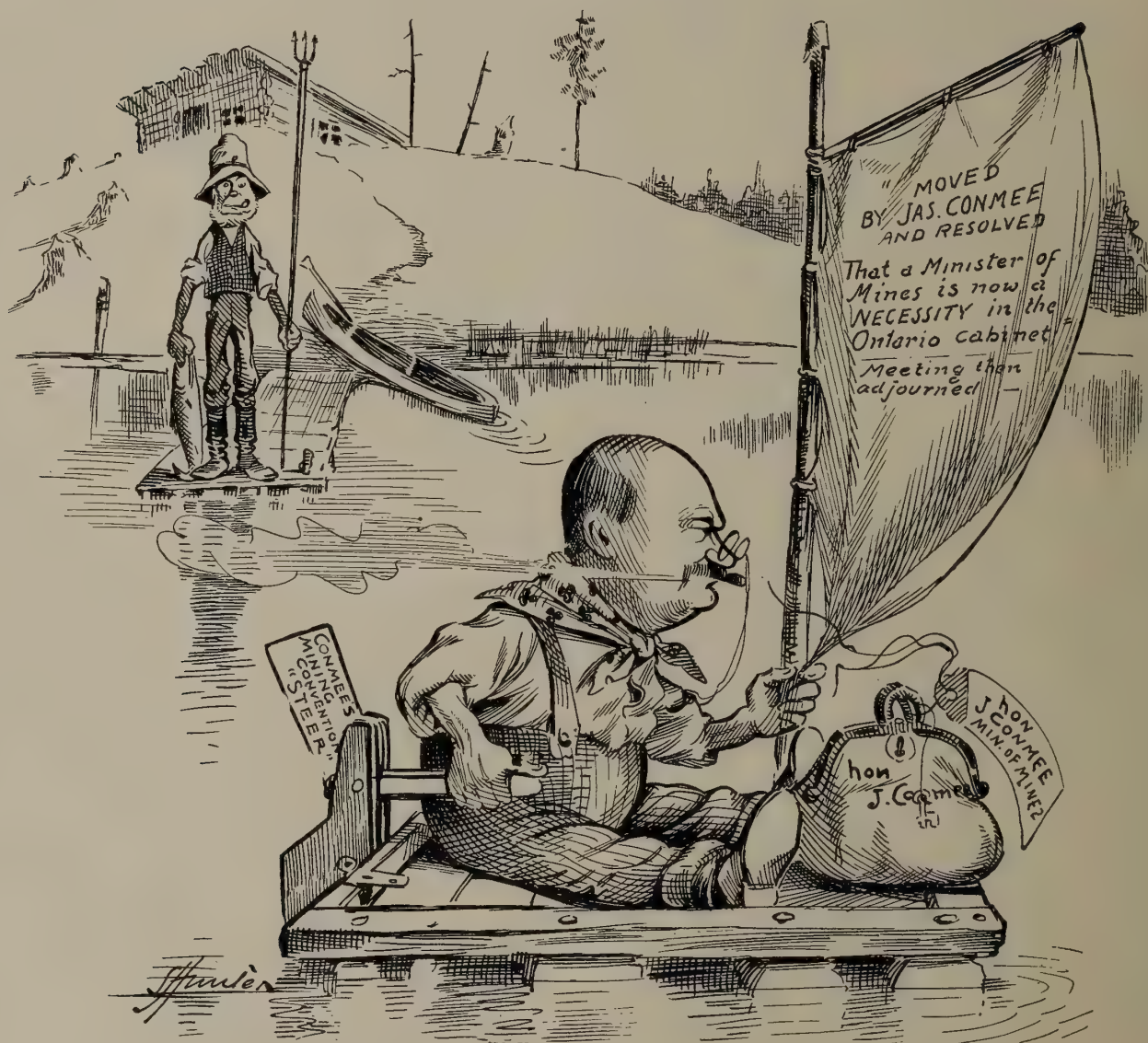
### Souris Coal Mining Co.

|                     |        |
|---------------------|--------|
| Tons raised in 1902 | 64,000 |
|---------------------|--------|

For other deliveries see January REVIEW.



## OPENING OF POLITICAL NAVIGATION ON RAINY RIVER.



CONSTITUENT: An' fwhat port are yez making for now, Mr. Conmee, sor?

MR. CONMEE: Port Folio, Denny—Port Folio, no less.

—*Toronto World.*



## COMPANY NOTES.

**War Eagle.**—The annual report to the shareholders, dated 24th Feb., says "during the past year developing work has been steadily pushed and the ore reserves increased. The heavy decline in the price of copper has been offset by the reduction in smelting rates, while the satisfactory solution of the problems of treating the low grades by milling now makes it certain that the large bodies of this ore exposed throughout the mine will soon be made available. The ore sales during the year were 21,455 tons net, averaging \$14.58 smelters gross assay value. The average contents were gold .66 oz. ; silver 1.2 oz. and payable under the new smelter rates are estimated at about 42,000 tons, averaging \$10.95 smelters gross assay value (pricing copper at 12 cents instead of 16.25 cents as the previous reports. The development of the mine has from the beginning continued to expose large quantities of ore too low in grade for smelting, but rich enough to promise a handsome profit to successful milling. Now that the difficulties of such treatment have been overcome, these low grade masses will soon be available. It is impossible to present any reliable estimate of their quantities or precise value, because their limits have not been clearly defined, and, until milling begins, they cannot be accurately sampled without excessive expense. The process of stoping them for the mill will undoubtedly developed much ore of higher grade which is not now disclosed by the workings."

**Ymir Gold Mines.**—The report of the Ymir Gold Mines, Ltd., to be submitted at the statutory meeting on the 18th inst., states that the total number of shares allotted is 200,000, all of which have been issued credited as paid up to the extent of 17s. per share, in consideration of the property and assets of the Ymir Gold Mines, Ltd. (Old Company), acquired by this company under agreement with the liquidator of the Ymir Gold Mines, Ltd. (Old Company), dated 21st November, 1902, which agreement has been filed with the registrar of joint stock companies. The total amount received by the company in respect of the 200,000 shares is £14,725. Payments in London on capital account—on account of liabilities of old company—amount to £14,027; handed to solicitors for registration expenses, etc., £550 (preliminary expenses are estimated at £600). In a circular accompanying the report, the directors state that of the £30,000 provided by the reconstruction, £15,000 has been called and £14,735 has been paid up, and this, with the profits of the mine, has enabled the completion of the shaft to be carried out with other important development work, and also has provided for all the company's liabilities, which, with the exception of about £3,000 not yet payable, are now extinguished. As requested by several shareholders, the directors have resolved to call up the balance of 1s. 6d. per share (making them fully paid). This will provide the necessary funds for still more vigorously proceeding with the development work, and at the same time leave the profits now being made available for distribution. The latest news received from the mine continues to be of a satisfactory nature—the profits for the months of November, December and January, after charging against revenue, development, repairs, and all other expenditure,

amounted approximately to £2,000, £1,540, and £2,380 respectively. The result was obtained by working 50 stamps in November and December, and 60 in January. Until connection had been made between the shaft and No. 10 level, development below No. 5 level was not practicable. Now this has been done, it is hoped that the full 80 stamps will shortly be employed. As shareholders have already been informed, the prospects here in an easterly direction were found to be very favourable.

**Mabou Coal Mining.**—Mr. J. Boardman Conn, C.E., writing to the REVIEW on the operations of the Company says: This Company acquired areas covering 15 square miles of coal lands on the northwest coast of Cape Breton about one year ago this coming spring. These areas are probably the only ones so far as known that contain all of the coal seams of the Nova Scotia coal fields in such position that they may be readily examined. Seven seams varying in thickness from 15 feet down to 3 feet are here exposed, and contain coal of almost all of the various grades mined in the Province.

The Company commenced operations in April, 1902, by starting a slope 11 feet by 7 feet in the clear on what is called the 7 foot seam, driving the slope at angle of 40 degrees. This slope was driven to the depth of 420 feet when levels were broken off to the right and left, and also a tunnel started at this depth connecting the so-called 8 foot seam; a tunnel is to be continued at this same depth to reach a still overlying seam of 11 feet. In June a slope was started 11 feet by 7 feet in the clear on an angle of 40 degrees on the so-called 15 foot seam. This slope has been driven down a distance of 400 feet, while levels have also been started on both sides of the slope. These levels will give a lift of some 300 feet of coal to a rise, and the first mining will be carried on from these levels. These slopes are now being continued downward, and at 800 feet a second set of levels will be broken off. Underground connections will be made with the overlying and underlaying seams as at the 400 foot levels, and the coal worked in rises of 400 feet.

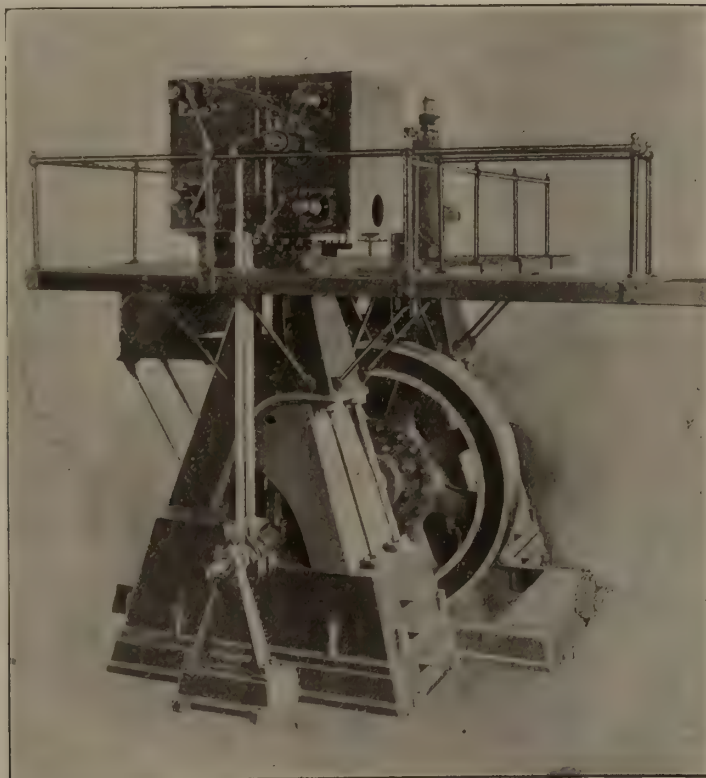
Eight 400 horse power boilers have been installed for air and hoisting purposes, and a duplex 20x32 Rand Compressor has been installed, and also a double 20x30 hoisting engine.

These slopes are so arranged that the bank heads from the mouth of the slope unite in the main bank head some 1000 feet distance where the coal is delivered to the screens situated over the cars upon a railroad which the company has just completed to a shipping port in Mabou Harbor. The company is also extending its line to a shipping point on Cariboo Cove where a wharf 800 feet long with coal pockets will be constructed as soon as the ice has gone in the spring.

The usual number of machine and blacksmith shops, barns, houses, and out buildings have been erected at the mines, and a force is kept constantly busy erecting new dwelling houses for the operators.

Shipments of coal will commence this coming spring, and the quality for its various purposes is thought to be as good as any now mined in the Province.

# THE LAURIE ENGINE COMPANY MONTREAL CANADA



500 H.P. Laurie Vertical Cross Compound Electrical Engine.

LAURIE CORLISS ENGINES ARE THE STANDARD FOR ALL POWER PURPOSES



**POGSON, PELOUBET & CO.**  
**PUBLIC ACCOUNTANTS**

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

FOR SALE

**SILVER AMBER MICA PROPERTY**

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pick lime). Terms and particulars on application.

**F. E. LEUSHNER,**

Room 12, James Bld., TORONTO, Toronto.

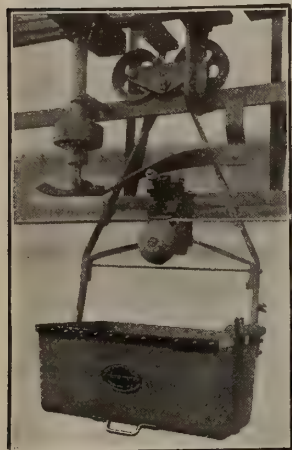
**WEBBER PATENT**

**COMPRESSION**

**GRIP**

with Patent Automatic Attacher

Used only on the  
Patent



No lugs or knots of any kind required on the traction rope, giving longer service, and saving in repairs.

**Bleichert Wire Rope Tramway**

**SUPERIOR TO ALL OTHERS.**

**THE TRENTON IRON CO.**

**TRENTON, N. J.**

Manufacturers, Engineers and Contractors, and sole licensees in North America for the Bleichert System. Also, Wire Rope Equipments for Cable Hoist-Conveyors, Surface and Underground Haulage, Transmission of Power, etc.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

**WANTED**

Vols. I and II General Mining Association of Quebec.

Vol. I Ontario Mining Institute.

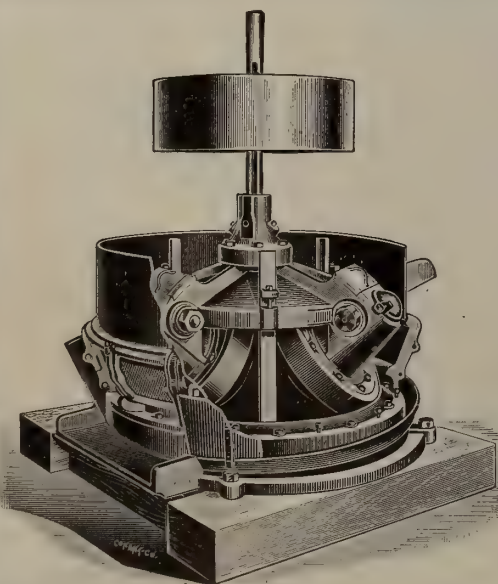
Vols. I, II and III Federated Canadian Mining Institute.

Vols. I, II, III and IV Canadian Mining Institute.

**\$20** WILL be paid for a complete set of these volumes. Readers having any, or all, of these copies for sale please write to

**The Canadian Mining Review**

OTTAWA, Canada.



**THE GRIFFIN**  
**THREE ROLLER**  
**..ORE MILL..**

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilean Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.



## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

# 60% PER ANNUM GUARANTEED

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT  
READY FOR THE MILL and the  
Hoodlum Claim, which adjoins the  
Old Victor Mine, yet to figure on.

A 200-TON PER DAY PLANT  
CONTRACTED FOR and will be  
in full operation not later than  
April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.  
Do not fail to investigate this proposition, for the more you investigate the more  
stock you will want. Write for prospectus.

W. H. BALDWIN & CO., Brokers and Financial Agents 49-50-51-52 VOLCKERT  
BLDG., ALBANY, N.Y.  
REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company,  
Los Angeles, Cal.; any mining journal of the state or prominent mining men.

## Bartlett Concentrating Table.

Bids for Manufacture in Canada.

The undersigned is prepared to grant licenses for the manufacture  
and sale of the

**BARTLETT CONCENTRATING TABLE,**

under Canadian patents No. 66546.

F. L. BARTLETT,

721 Seventeenth St.

DENVER, Col.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

## Brunton's Patent Pocket Transit

For Surface or Underground Surveys



THE accompanying illustration shows an  
operator taking vertical angles with the  
Brunton Patent Pocket Transit.

It is the most accurate and reliable pocket  
instrument made for preliminary surveys of  
every description.

Case of aluminum  $2\frac{3}{4}$  by  $2\frac{3}{4}$  by 1 inches;  
weight 8 ounces.

Nearly 1,000 in use by prominent mining  
engineers, mine managers, civil engineers and  
geologists everywhere.

May be purchased from any reliable supply house  
or direct from the sole manufacturers . . . . .

## Wm. Ainsworth & Sons,

Sole Manufacturers

Denver, Colo., U. S. A.

Send for Catalogue B-5 for full particulars.

# BRIQUETTING MACHINERY FOR SMELTERS AND BLAST FURNACES...

BRIQUETTE your Flue Dust, Fine Ores, Calcines, Concentrates, Slimes and other Mineral Fines

INCREASES THE CAPACITY OF THE FURNACE FROM 10 TO 25 PER CENT.

Our Improved WHITE MINERAL PRESS the only successful machine for the purpose.

Adopted by most all the Prominent Smelters in the United States.

Used by several Large Steel Works for briquetting Common Iron Flue Dust.

Sent on Trial and  
Satisfaction Guaranteed.

## CHISHOLM, BOYD & WHITE CO.

CATALOGUE MAILED ON  
REQUEST

OFFICE AND WORKS: 5700 Wallace St.

CHICAGO, ILL., U. S. A.

# WIRE ROPE

We carry a Large Stock.

W. H. C. MUSSEN  
& CO.

MONTREAL

Obtain our Prices.

# MINE RAILS



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

**ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.**

**THE CANDA PATENT SELF-LOCKING CAM**

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to



**CHROME STEEL WORKS,  
BROOKLYN, N.Y., U.S.A.**

KENT AVENUE, KEAP  
AND HOOPER STREETS.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

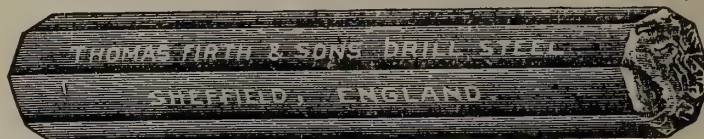
T. I. JONES, Treasurer.

**THOS. FIRTH & SONS, Ltd., Sheffield,  
Tool Steel and Rock Drill Steel**

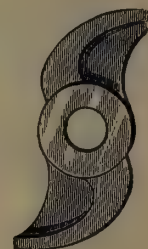
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



**H. W. DeCOURTENAY & CO.**

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

**LUNKENHEIMER**

**MECHANICAL OIL PUMP**

A MECHANICAL OIL PUMP to be a success should embody the following principles: It should be simple, practical, well made, durable, reliable; absolutely positive, and devoid of clap-trap mechanism. The Lunkenheimer Mechanical Oil Pump possesses all the above features. It touches the spot and puts the oil where it is needed. Every pump rigidly tested, inspected and warranted to satisfy. Specify "Lunkenheimer" make and order from your dealer. Write for catalog of brass and iron Valves, Injectors, Whistles, Lubricators, Steam Traps, Oil and Grease Cups, etc., all of superior quality.

**THE LUNKENHEIMER CO.**  
Sole Makers.

Branches: New York, 26 Cortlandt St. CINCINNATI, O. U.S.A.  
London, 35 Great Dover St.

**Canada Atlantic Ry.**

THE SHORT FAVORITE ROUTE

BETWEEN

Ottawa and Montreal.

TRAINS DAILY

EXCEPT SUNDAY

8 And Sunday Train Both Directions 8

PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Wagner Sleepers between Ottawa and New York  
Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket  
agent of this company or connecting lines.

E. J. CHAMBERLIN,  
General Manager.

J. E. WALSH,  
Ass. Gen. Passenger Agt.

C. J. SMITH, Gen. Traffic Manager.



# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST MANUFACTURERS MINERS SAFETY LAMPS OF ALL KINDS

DAVIS'S PATENT ELECTRICALLY  
LIT LAMP TO BURN SPIRITS.



Stock at Montreal.



Sole Representative  
for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building  
MONTREAL.

Send for Catalogue and Prices.

DAVIS'S "A.1" DEPUTY'S FIREBOSS  
AND SHOT-FIRER'S LAMP.



DAVIS'S "A.1" DEPUTY'S FIREBOSS  
AND SHOT-FIRER'S LAMP.

## A. LESCHEN & SONS ROPE CO.

SOLE MANUFACTURERS OF

Patent Flattened  
Strand Wire Rope



Trade Mark Registered

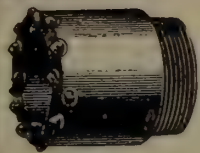
REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

LESCHEN'S Aerial Wire Rope TRAMWAYS

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

BRANCHES: New York, Chicago, San Francisco.



## BERNARD BANDLER

IMPORTER OF

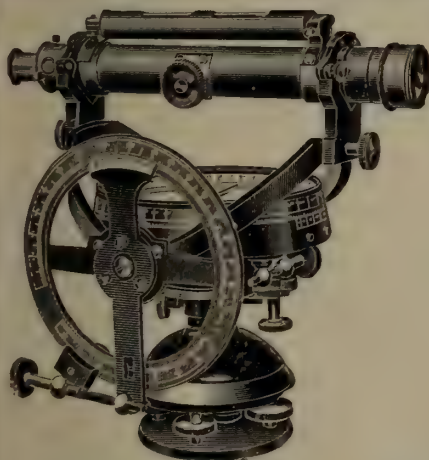
## CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes



GOODS SENT SUBJECT TO APPROVAL

65 Nassau Street, NEW YORK, N.Y.



COMBINED THEODOLITE AND  
MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine  
Staff, 6 feet, closing to  
20 inches, very port-  
able. .... £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at  
the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

CREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

### The Cumberland Railway & Coal Company

Are prepared to deliver this well known  
Steam Coal at all points on the lines of  
G. T. R., C. P. R. and I. C. Railways.

Head Office: 107 ST. JAMES STREET, MONTREAL

Address: P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

---

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

---

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

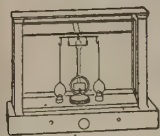
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.



## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

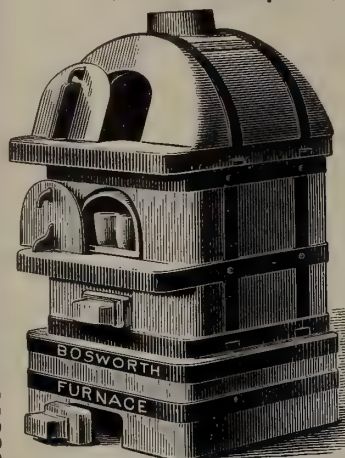
CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.



### ASSAYERS and CHEMISTS

### SUPPLIES.

MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR

**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

### COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

Munktel's Swedish Filters.

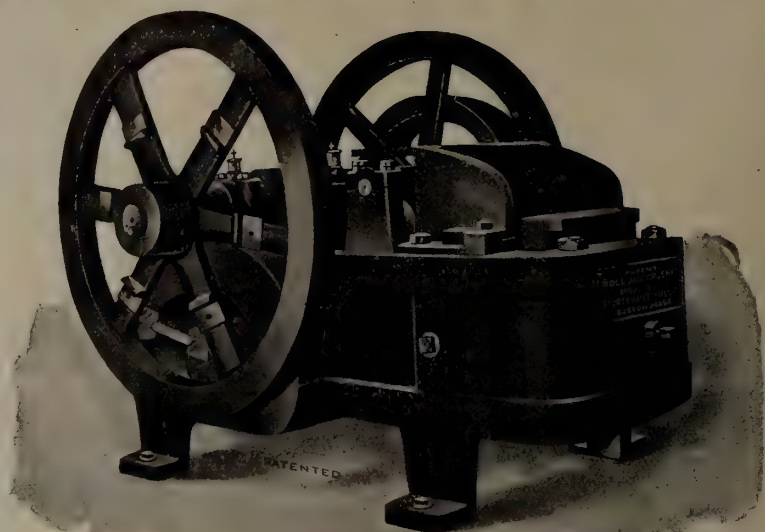
OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET

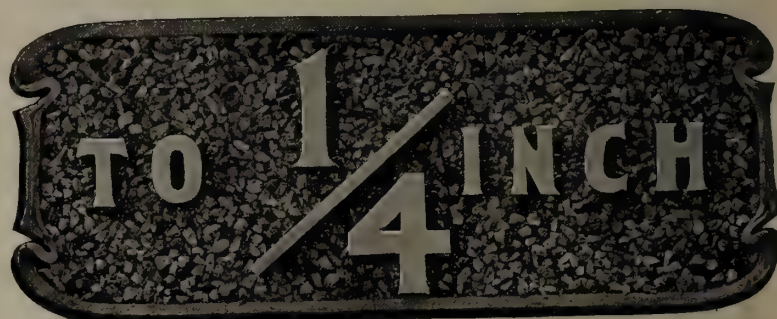
MONTREAL.

## ROLL JAW CRUSHER



Direct product actual size from a ROLL JAW CRUSHER without screens

The only machines able to crush  
large, hard ore



Do not clog

Can also do coarse work

Jaw Crushers work at 1-5 the cost of other machines;  
therefore crush fine, and increase capacity and save wear of your  
stamps, rolls and mills by feeding quarter and half-inch ores.  
Nothing pays better. Hundreds of Roll Jaw Crushers in use.  
Best references.

Send for catalogue "1903," of Crushing,  
Grinding and Screening Machinery.

## STURTEVANT MILL CO.

BOSTON, MASS.

Stocks in Denver and Salt Lake City  
Also represented on the coast.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

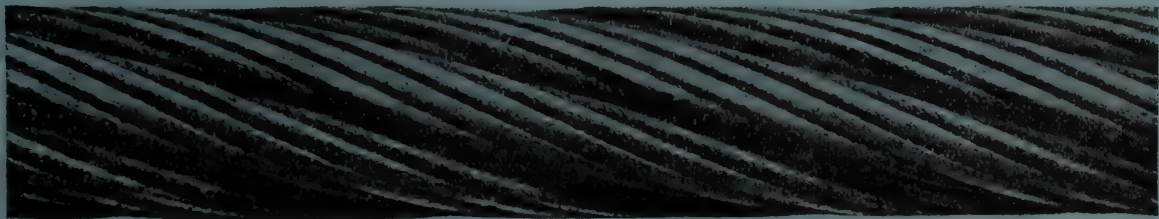
## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

Illustration of Winding  
Rope, 240 fms. long x  
3½ circ. Galvanized  
Special Improved  
Patent Steel, Com-  
pound Make, supplied



to Kenneil Collieries,  
Bo'ness, Scot., which  
gave a record life of 6  
years and 2 months.  
Shewing condition  
when taken off.

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

## Drummond, McCall & Co.

**IRON, STEEL and GENERAL METAL MERCHANTS**

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steel Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: **CANADA LIFE BUILDING - MONTREAL.**

**Montreal Pipe Foundry Co.**

Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

**Canada Life Building - MONTREAL.**

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also

"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES:

**CANADA LIFE BUILDING, MONTREAL.**

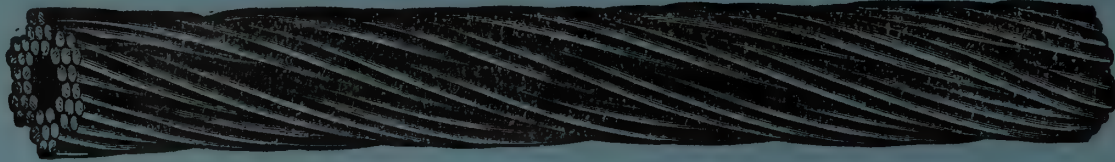
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

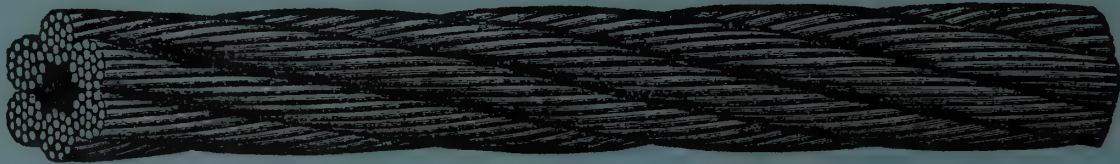
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**JAMES COOPER**

ORE

AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS

Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

CATALOGUE  
ON  
APPLICATION

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.



TWENTY-FIRST YEAR OF PUBLICATION

# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. III.

OTTAWA, MARCH 31st, 1903.

Vol. XXII—No. III.

|                                    |                                                                                                                                                                                             |                        |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <b>AIR<br/>COMPRESSORS<br/>GAS</b> | <b>THE CANADIAN RAND DRILL CO.</b><br>SHERBROOKE, QUE.<br>BRANCH OFFICES IN<br>MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.<br>ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD,<br>VANCOUVER, B.C. | <b>ROCK<br/>DRILLS</b> |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co

ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

### PETERBOROUGH

### NELSON

### VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills,  
Concentration, Chlorination, Cyanide and Smelter Equipments.



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

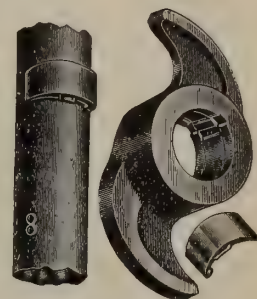
## ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

### THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to



## CHROME STEEL WORKS, BROOKLYN, N.Y., U.S.A.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

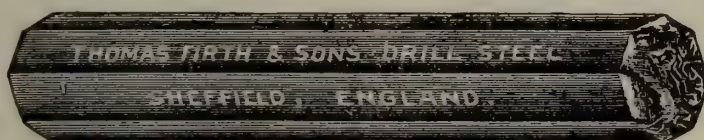
T. I. JONES, Treasurer.

## THOS. FIRTH & SONS, Ltd., Sheffield, Tool Steel and Rock Drill Steel

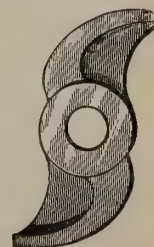
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL SHELLS, CRUSHER PLATES.



## H. W. DeCOURTENAY & CO.

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

## The LUNKENHEIMER VALVES

Iron Body, Brass Mounted, Globe, Angle, Cross, Check and Swing Check Valves



Are made of best materials and fully warranted. Made in screw and flange ends from two inches up. Endorsed and specified by intelligent steam users everywhere. Write for catalogue of Superior Brass and Iron Engineering Appliances.

### THE LUNKENHEIMER COMPANY

Main Office and Works: CINCINNATI, OHIO, U. S. A.

BRANCHES: 26 Cortlandt Street, NEW YORK; 35 Great Dover Street, LONDON.

## C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.

SPECIALTIES:  
Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

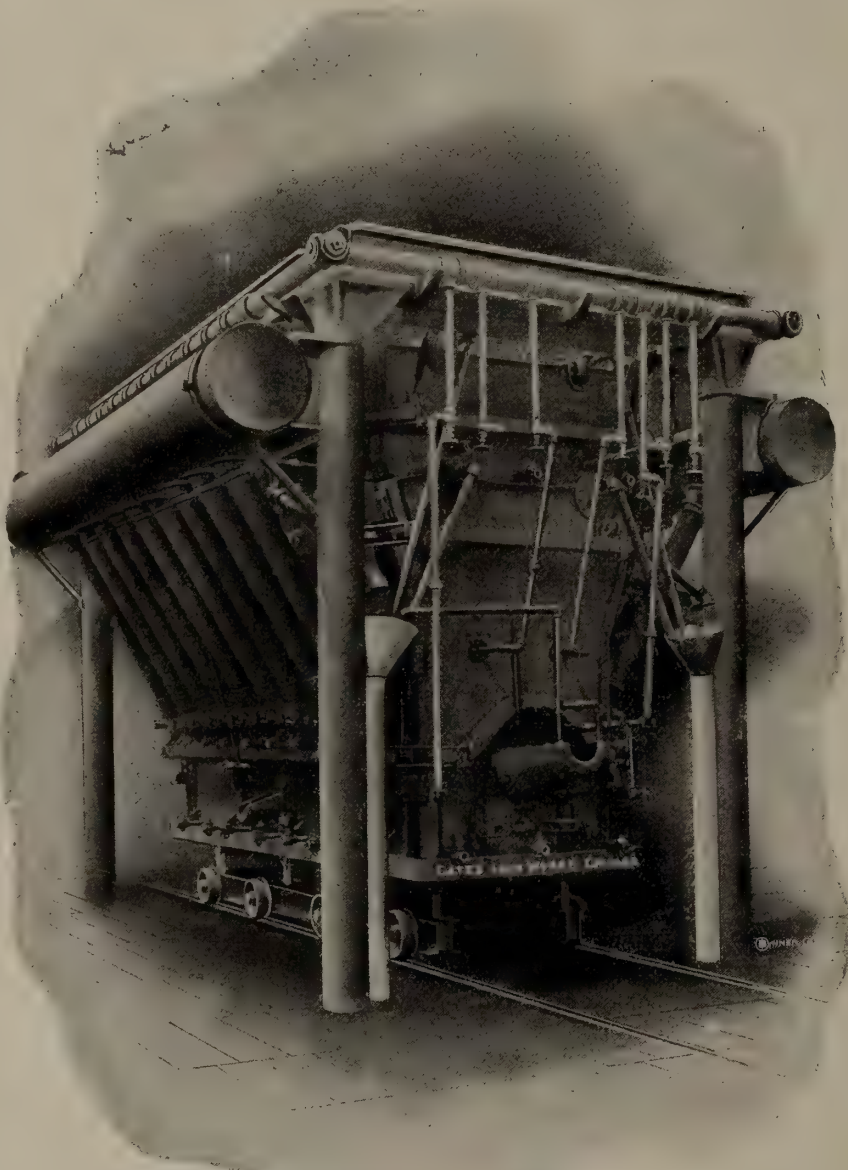
FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'F'G CO.,  
SCRANTON, PA.

WE ARE EXTENSIVE BUILDERS OF

## Smelting Machinery



RECTANGULAR WATER-JACKETED COPPER FURNACE. Size, 44 in. x 160 in.

This illustration shows one of four 44 in. x 160 in. Steel Water-Jacketed Copper Furnaces built by us for the Granby Consolidated Mining & Smelting Co., of British Columbia.

This furnace, which embodies all the latest improvements in copper smelting, has an extraordinarily large capacity and is giving most excellent satisfaction.

For the past thirty years we have made the manufacture of Copper and Lead Smelting Plants a specialty.

We have the largest shops in the world devoted to this class of work, equipped with the most improved machinery.

WE BUILD

Copper and Lead Furnaces  
Copper and Lead  
Smelting Plants  
Copper Converting Plants  
Copper Converters

SOLE BUILDERS OF

## REYNOLDS BLOWING ENGINES

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Fryck Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, Dooly Block  
SPOKANE, Washington

GENERAL

OFFICE

CHICAGO,



ILL., U.S.A.

HOME INSURANCE BUILDING

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumbermen's Exch'ge Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hemen Bldg.  
ATLANTA, GA., Equitable Bldg.  
LONDON, ENG., 160 Dashwood House  
JOHANNESBURG, South Africa



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

SUCCESSOR TO

SOLE BUILDERS OF THE

## Brown Roasting Furnace



SOLE BUILDERS OF THE

## Holthoff-Wethey Roasting Furnace



SOLE BUILDERS OF THE

## Jackling Roasting Furnace

All Ores and Mattes in a pulverized condition which require roasting for subsequent metallurgical operations can be satisfactorily roasted in any of the above furnaces. Sizes, cost and other information cheerfully furnished.

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, Dooly Block  
SPOKANE, Washington

GENERAL

OFFICE

CHICAGO,



ILL., U.S.A.

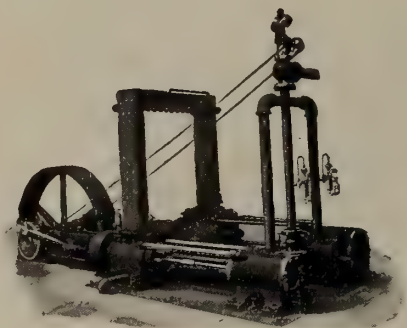
HOME INSURANCE BUILDING

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumbermen's Exch'ge Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
LONDON, ENG., 160 Dashwood House  
JOHANNESBURG, South Africa



# THE CANADIAN RAND DRILL CO



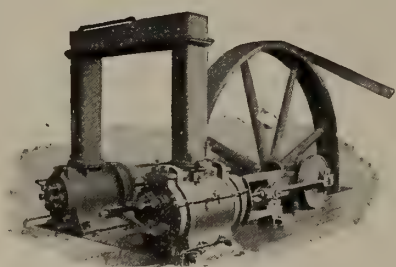
Class B-D Compressor  
[Air Cylinders next to Frame]



Duplex (Meyer-Valve) Compressor



Straight Line Belt Driven Compressor



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Cross-Compound Corliss Compressor

**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE



**The Popular Fuse Throughout the Dominion**

SOLE MANUFACTURERS

**WM. BENNETT SONS & Co.**

ROSKEAR SAFETY FUSE WORKS

**Camborne, Cornwall, England.**

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

MECHANICS SUPPLY CO., Quebec.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

**THE HAMILTON BRASS  
MFG. CO., Limited.**

HAMILTON. ONT.



# INGERSOLL-SERGEANT

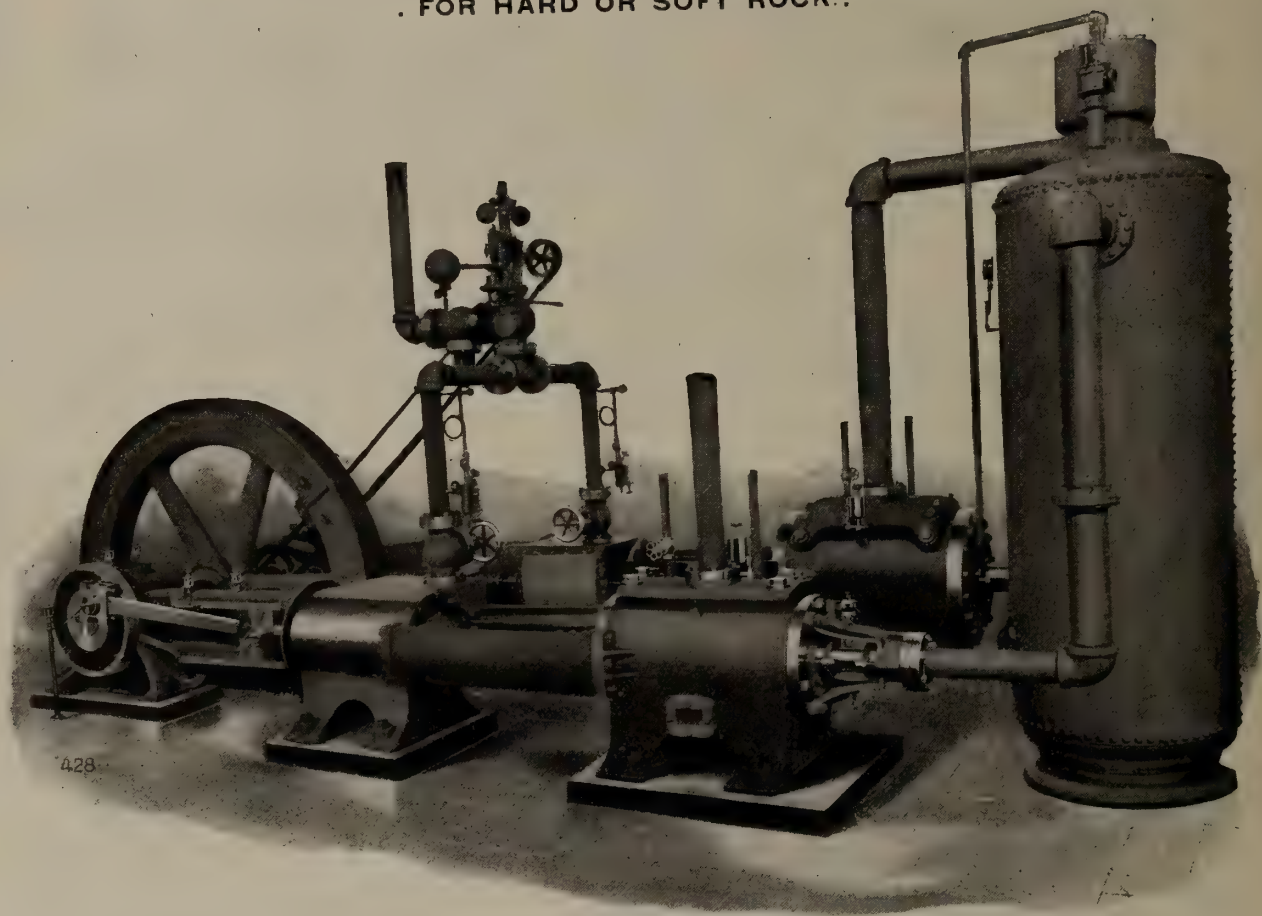
## AIR COMPRESSORS

...SIMPLE OR COMPOUND...

AND

## ROCK DRILLS

FOR HARD OR SOFT ROCK..



DUPLEX STEAM ACTUATED COMPOUND AIR COMPRESSOR, CLASS G  
With Compound Double Acting Air Cylinder and Receiver Intercooler.

COMPLETE MINING AND QUARRYING PLANTS.

# JAMES COOPER MAN'F'G CO. LIMITED

## MONTREAL.

BRANCHES—124 Hollis St., Halifax, N.S.

c/o Diamond Drill Co., Rat Portage, Ont.

P.O. Building, Rossland, B.C.

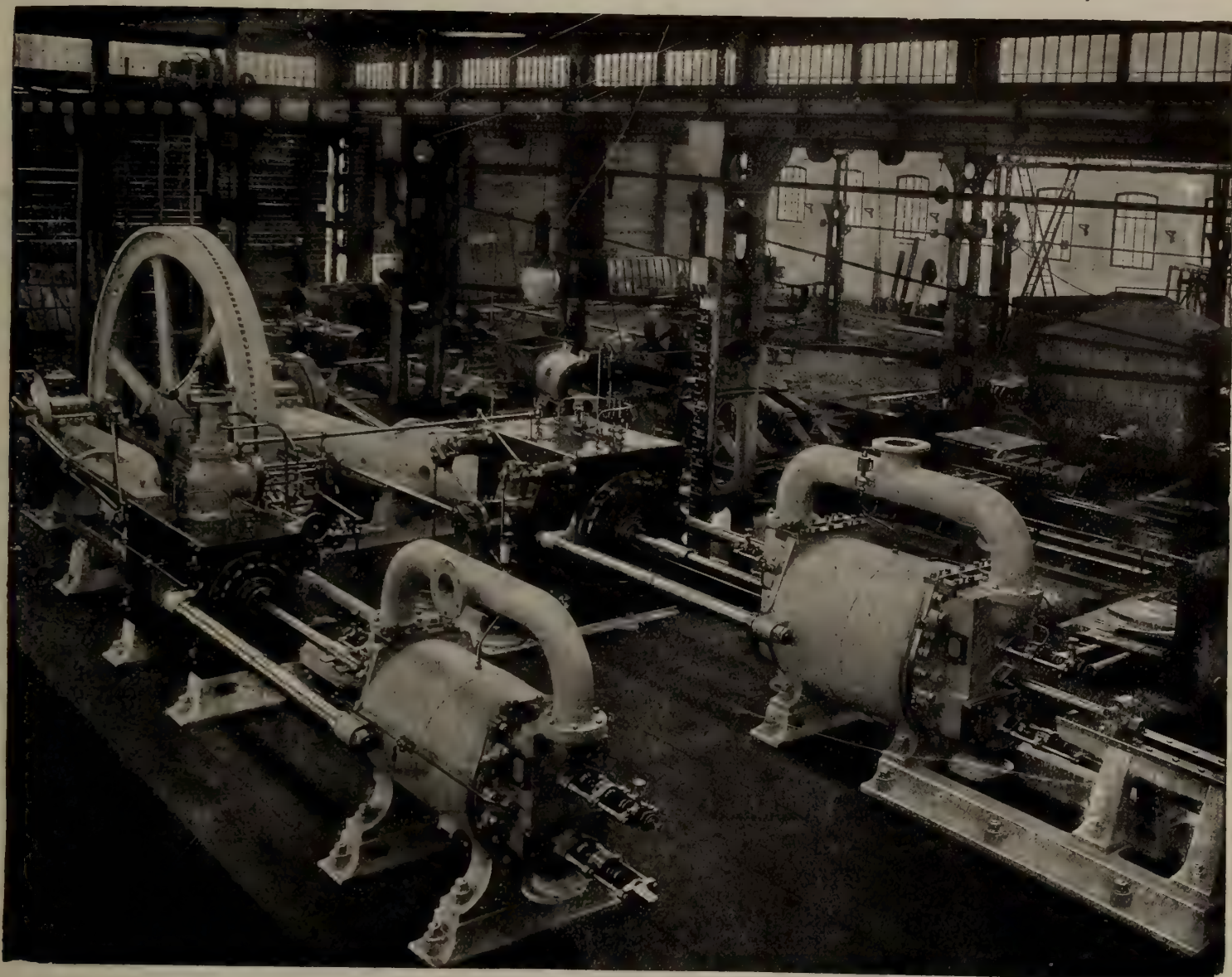


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons

## Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

••••• WORKING MACHINERY

....FOR....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
 BOILER SHOPS, ENGINE WORKS,  
 CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

# MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
 ... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices

LONDONNEW YORKPARIS

J. BASZANGER &amp; CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

(BLACK DIAMONDS)  
 AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

# STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

**Steel Works and Head Office : NEW GLASGOW, N.S.**



# DIAMOND

## DEEP DRILLING

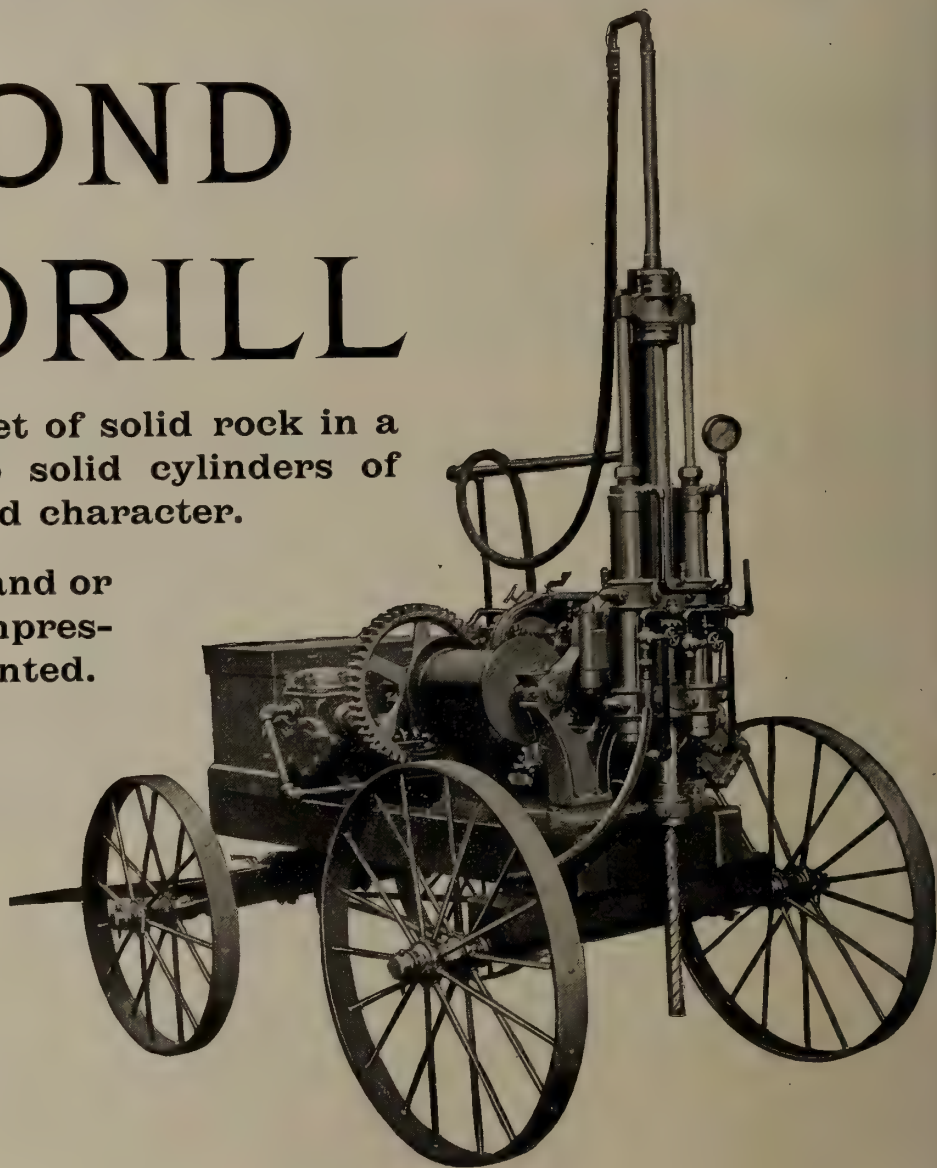
makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

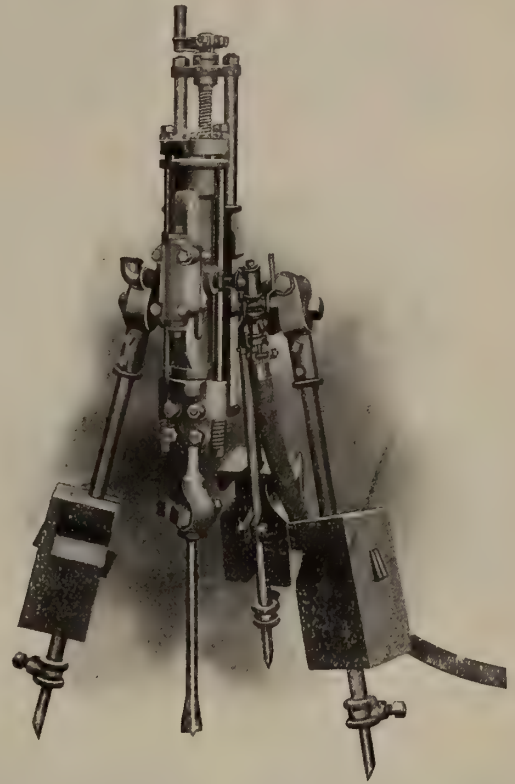
# ROCK DRILLS



# Sullivan Rock Drills

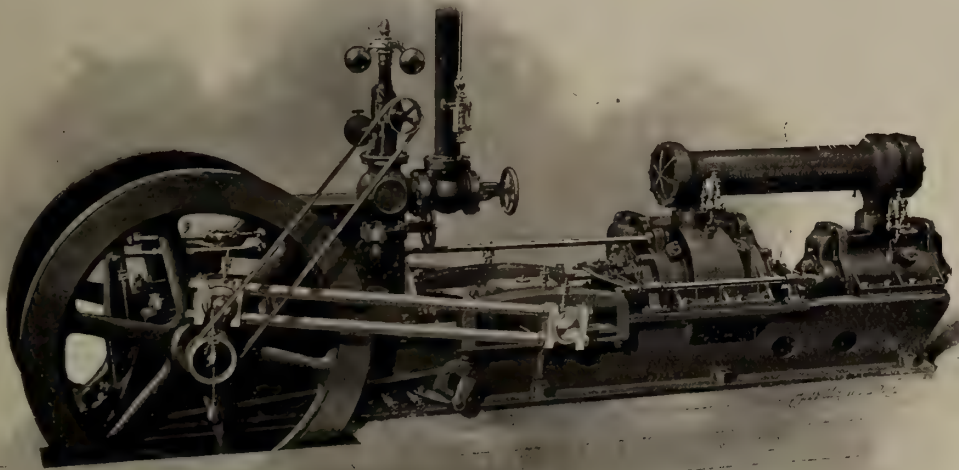
GREAT CAPACITY  
FEW WORKING PARTS  
SMALL REPAIR COSTS

SULLIVAN and BULLOCK  
DIAMOND CORE DRILLS.



# AIR COMPRESSORS

COMPLETE LINE



MODERN  
EFFICIENT  
ECONOMICAL  
HOISTING  
ENGINES.

To insure Prompt Attention,  
address Dep't 7.

# SULLIVAN MACHINERY CO.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.

135 ADAMS STREET  
CHICAGO - - U. S. A.

NEW YORK  
PITTSBURG



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the . . .

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office : MONTREAL, Que.

**JAS. P. CLEGHORN,**  
 President.

**CHARLES FERGIE,**  
 Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLANCE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.

**C. SHIELDS, 2nd Vice-President and General Manager.**





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

COAL CUTTERS

Power Drills

Screens

Crushers

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.

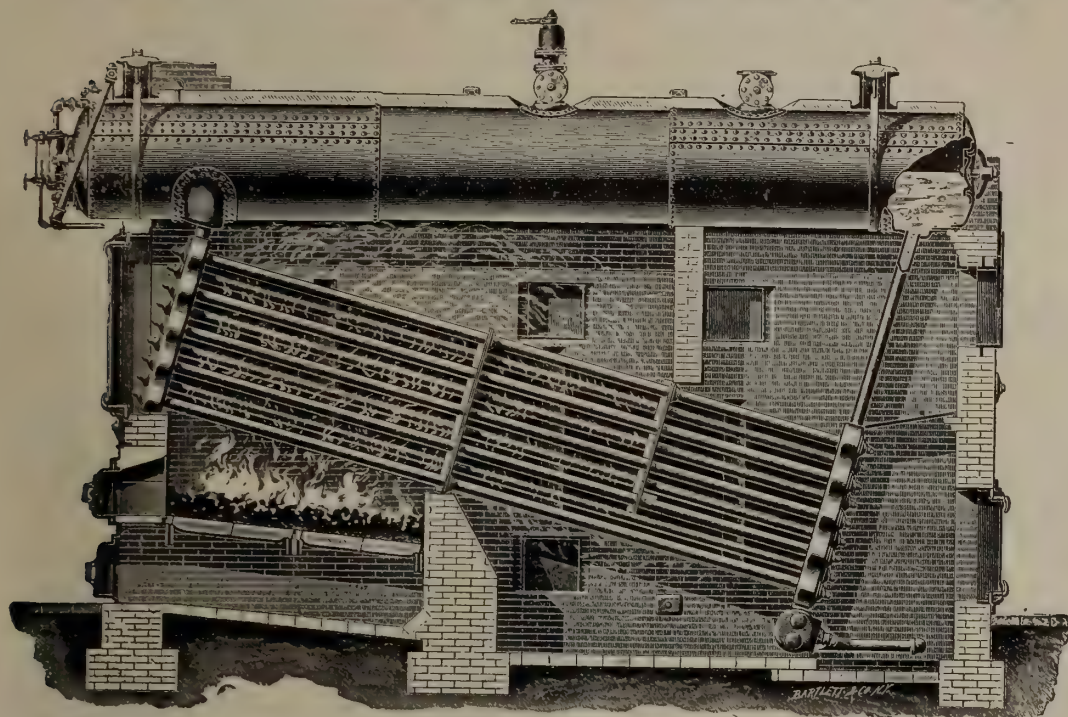


NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company



# Electric Blasting Apparatus.

Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

MANUFACTURED  
ONLY BY

SEND FOR  
CATALOGUE



# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

# WIRE ROPE

**"WHITECROSS" Best English Rope**

Plough Steel and Other Grades.

Imported Promptly at Lowest Prices.

**A. C. LESLIE & CO., Canadian Agents, Montreal.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and Lachine Locks, P.Q.

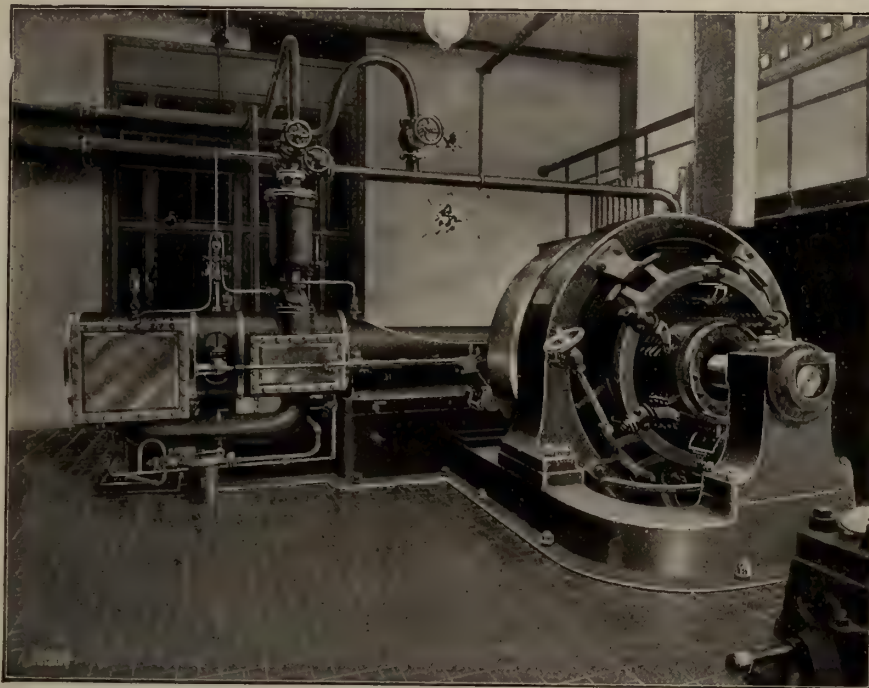
# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works.. **OTTAWA**



## A British Compliment to Canadian Engineering



The engine shown in cut was supplied by us to the Municipal Technical School, Manchester, England, for electric lighting.

It was ordered on the recommendation of Dr. J. T. Nicholson, Professor of Engineering, who was formerly of the Institute of Science, McGill University, Montreal.

The purchasers state this engine is to be placed with other engines supplied by the leading British makers as an example of the best English and foreign practice in engineering.

# Robb Engineering Co. Ltd.

AMHERST, N.S.

Agents { WILLIAM McKAY, 19 McKenzie Crescent, Toronto.  
WATSON JACK & CO., 7 St. Helen St., Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

#### 1. THREE YEARS' COURSE FOR A DIPLOMA IN

- (a) Mining Engineering.
- (b) Analytical Chemistry and Assaying.

#### 2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN

##### GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

##### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

##### GROUP III.

- (h) Biology and Public Health.

#### 3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

#### 4. POST-GRADUATE COURSE FOR THE DEGREE OF Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

**Next Session begins  
October 1st, 1902.**

**MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

**RICE LEWIS & SON**  
 LIMITED  
 HARDWARE TORONTO

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

### STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.

For **DYNAMITE AND EXPLOSIVES** For  
 Miners Quarrymen  
 Pit Sinkers Contractors

... Manufacturers and Dealers in ...

### ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
 President.  
 C. A. MACPHERSON,  
 Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

### School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

**L. B. STEWART, Secretary.**



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

LOBNITZ & CO., LIMITED,  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE.  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., Ltd. RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW Al Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

**WILL WORK IN ANY POSITION, IN ANY ROCK.**

It Saves Steel,

It Saves Labor,

It Saves Money.

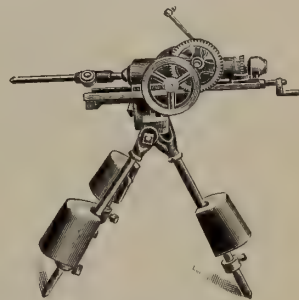


Write for Catalogue.

**H. D. CRIPPEN**

SOLE  
MANUFACTURER

**52 Broadway, New York**



## The Colorado Iron Works Co. DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.  
DENVER, Colo.**



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
Metals, Mattes, Etc.  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

**8** TRAINS DAILY **8**  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Wagner Sleepers between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket  
agent of this company or connecting lines.

E. J. CHAMBERLIN, J. E. WALSH,  
General Manager. Ass. Gen. Passenger Agt.

C. J. SMITH, Gen. Traffic Manager.

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL

FOR  
NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

## LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

## OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,

Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CABLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

## Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

## McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

## FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

## POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.  
1627 Champa St., Denver, Colo.

## E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

## S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON . . . . YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street MONTREAL

**ASSAYS OF ORES**ANALYSES of all materials made with greatest accuracy.  
SAMPLES BY MAIL—1 cent per 4 ozs.; limit 24 ozs.  
INSTRUCTION IN ASSAYING, Etc., to Prospect-  
ors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE . . . . ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining Engineers. Surveyors and  
Valuers.8-KING STREET-8  
MANCHESTER, ENGLAND.**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. Gwillim, B.Sc.**MINING  
ENGINEER

KINGSTON . . . B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE . . . ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

879 DORCHESTER STREET, MONTREAL

CANADA.



## The Farrel Patent Crusher

Sizes :

**STANDARD**

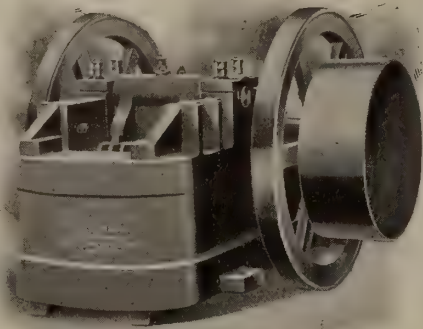
7 x 10 to  
42 x 30.

**DUPLEX**

40x6 to 72x8

**PORTABLE**

7 x 10  
16 x 10



Capacities  
Ranging from  
50 to 1500  
tons per 10  
hours  
depending on  
size of  
product  
required.

MAY WE SEND 1903 CATALOGUE.

Constructed with frame of solid semi-steel, steel Pitman, and jaw plates of chilled iron or manganese steel, this crusher has no superior.

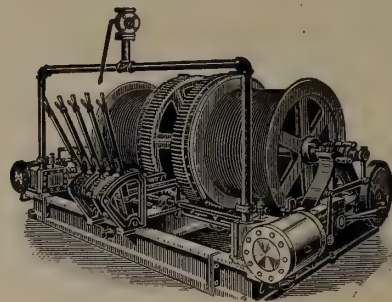
PRICES ON APPLICATION

**The Jenckes Machine Company**

HEAD OFFICE **Sherbrooke, Que.** 27 Lansdowne St.

**M. BEATTY & SONS,**

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS. Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS :

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# WIRE ROPE

"ACME" brand extra tensile strength for heavy work.

Should only be used on special large wheels and drums.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.

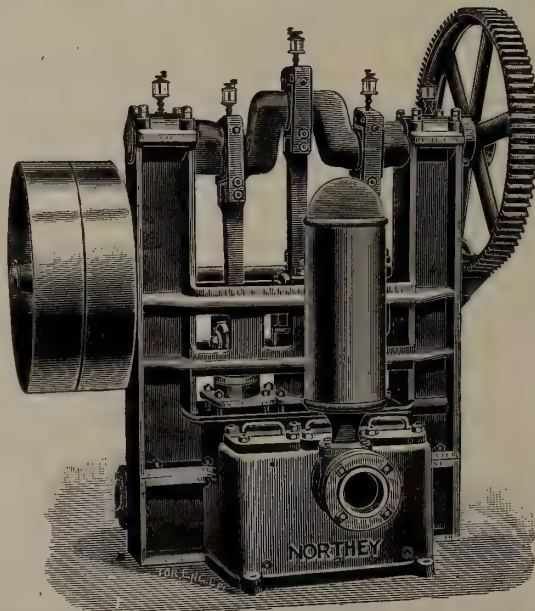
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 3.

MARCH, 1903.

VOL. XXII., No. 3.

## Another!

Another graphite prospectus calls for notice. The artist, whose free, generous treatment of his subject reminds us of our friend of the Empire Mica idyl, requests, his readers to "eliminate from their minds every other variety of mining enterprise," as a preparation for the event of the Grenville Graphite Company into their consciousness; "for," he writes, (and we could laugh if it were not that so many foolish people will be found to listen to the voice of the siren) "this graphite mine is not to be compared with gold, silver, and copper mines." He has in his mind's eye the suspicious reception of his rosy picture by those who have invested before on the strength of his high falutin representations. "It is not a mining proposition,"—he actually stumbles on the truth,—"*it is lying exposed*,"—quite correct, and we shall proceed to expose it further so that he that runs may read; and guideless reader, "when you have seen that the Grenville Graphite Company will be in a position, within a very few month, to control the American graphite market," it will be quite soon enough to buy a few million shares.

This marvellous exhibition of the longbow opens with a paragraph which is so rich that we quote it pretty fully so that our mining friends may laugh.

"There are only two graphite mines in the world. These two deposits measure the visible supply of one of the most important minerals used in commerce, in the arts and sciences. One of the two deposits is owned and worked by the natives of the Island of Ceylon, in Asia, and until a very recent day it was supposed that graphite mining must always be confined to this celebrated deposit.—The most energetic prospecting for many years in all quarters of the globe has failed to reveal any other deposit of the mineral which it would pay to work. . . (*This is discouraging for our friends of the Black Donald*). The second of the world's great graphite deposits, located (*Of course!*) at Grenville, Canada, is about to be opened up on a scale which, *in a few months*, (*Italics ours*) will surpass the operations in the famous Ceylon graphite mine."

As a matter of fact Ceylon is producing less than one half of the world's supply of graphite, —in 1899 (the statistics nearest at hand) 32,067 metric tons out of a total of 83,928 metric tons. Austria produced in the same year, 31,819 metric tons. In 1902 the United States produced about 2,000 tons of crystalline and 1,300 tons of amorphous graphite. Italy and Germany are also large producers. Then there is the artificial graphite being made in large quantities at Niagara Falls by the Acheson process, and acknowledged to be a

formidable competitor in "electrical work," although our prospectus-maker assures the investor that "no substitute has ever been discovered which will perform its office, nor is there likely to be found a material which will take its place," i.e. the place of material graphite. He also lets out incidentally the trade secret that graphite is used "to give rubber its flexibility."

Mr. H. P. H. Brumell, at one time an assistant in the statistical branch of the Geological Survey of Canada, has incautiously put himself into the hands of the boomster by his singular methods of computing ore exposed on the surface as "ore available," which he calculates as 900,000 tons, although his description implies that the ore is not "in sight" in the sense of being blocked out.

In the absence of this, as is well known, there is no certainty about the contents of the deposit; and it is very much to be regretted that a former official of the Geological Survey should have laid himself open to question by this loose method of computation. He has however been cautious enough to declare the impracticability of estimating the value of the other veins on the property. But W. J. P. Williams, mining expert, whoever he may be, sees him and goes him five better! Under his magic touch the modest 900,000 tons expand into 6,600,000! And with this as a basis he easily calculates that the net profits of the company *should be* \$165,000,000 on the ore *now known to be available (!)*. This veracious mining expert also informs us that the mine at Grenville "is the only graphite mine on this continent," and that "there is nothing possible in the way of increasing production" Is it any wonder that we have reached the present accepted definition and classification of *mining expert*? Place this statement of Williams beside the fact that five of the States to the south of us are now producing graphite and that graphite properties are being developed in five others.

But this, like all fake prospectuses, needs only to be read to be condemned. The wonder is that anybody is deceived by such glaring absurdities and contradictions. For example, Mr. Brumell's report (p. 10) gives 15% as a conservative estimate of the content of the ore. When we reach p. 18 this has grown to 25% (also called a conservative estimate), and by the time we arrive at p. 20 there are "1,600,000 tons of pure graphite blocked out." Truly, as we are told on the next page "this is *not* a mining proposition," "*it is lying exposed*," and "the figures given are ultra conservative, so made in order that the Company may not be thought to be making extravagant promises." Not at all! A promise of 25% dividends on the capitalization at \$4,000,000 of a partly developed prospect! This can hardly be called extravagant. It transcends such a commonplace adjective! It should rather be



described as colossal lying. By the way there is surely a slight inaccuracy in the cable address, *Grengraph*, it should have been *Greengraft*.

That legitimate mining enterprise should have to endure this sort of thing is one of the puzzles. Here is a prospectus the very terms of which show that it is a crude, vulgar scheme to extract a large sum of money from the unwary small investors of Canada and the United States. It is "not a mining proposition," but a stock-selling enterprise. There may be, and probably is, a workable deposit of graphite at Grenville; but it is in a fair way to be brought into disrepute by the unscrupulous methods of the promoters of the Grenville Graphite Company; and thus investment in legitimate mining will be once more discouraged. Investors should know that the method of the Grenville Graphite Company and their like is *not* "the usual and only way" to develop a prospect, although it is too common a way by which conscienceless promoters line their pockets at the expense of the investors.

As a final example of the misrepresentations to be found in this precious document let us set down here a little of the history of the Grenville graphite deposits, to be read in the light of the prospectus, which tries to give the impression that the discovery is a comparatively recent one. Logan noted it in the Report of Geological Survey for 1845-46, so that our knowledge of it extends back more than fifty years! It was worked and abandoned at various times. In 1876 it is reported as having been opened to a depth of thirty feet along sixty feet of its course, and some of the graphite had been exported. Osann (Geological Survey Report, 1902) describes it as follows. "The graphite which is worth mining occurs in the limestone as undoubted filling of fissures and veins, which occurs together locally with almost parallel strike. Few of those veins are more than 1 decim. ( $3\frac{3}{4}$  inches) in thickness. The limestone between the graphite veins is very much altered, and particularly rich in quartz. . . . At the same time there has occurred a strong impregnation of graphite, so that in the neighbourhood of the cracks *the rock has become almost black*." Contrast this with the boomster's 1,500,000 tons of solid graphite and judge whether it is time to buy a million shares or so in the Greengraft Graphite Company.

### A Few Suggestions on Mineral Statistics.

By EUGENE COSTE, M.E., Toronto.

Before offering the following suggestions on "Mineral Statistics" I suppose I have first to plead guilty for the introduction (in the two first statistical reports of our Geological Survey, in 1886 and 1887) of the very system, or rather want of system, which I am now about to criticize, as I have felt for some time that it could be much improved to the great advantage of our mining and metallurgical industries. Being human we are, of course, all liable to errors, even in our best efforts, but false pride should never prevent us from endeavoring to rectify and improve even, if in so doing, we have to acknowledge mistakes of the past. Acting on this principle I am willing to do my best towards this rectification, but it can only now, on my part, take the form of suggestions, since I have long ago resigned my former position of Mining Engineer of the Geological Survey.

Clearness is the essential point of all good statistics; it is even paramount to absolute accuracy which often cannot be obtained, especially in this case of voluntarily mineral statistics collected by the Geological Survey or even when collected with more power of law, by our Provincial Mining Bureaus. But no matter how accurate statistics may be they will lose most of their value if they do not deal in the same tables, with clearly defined units of the same class and character. If, for instance, we add in a statistical table the value of wheat with the

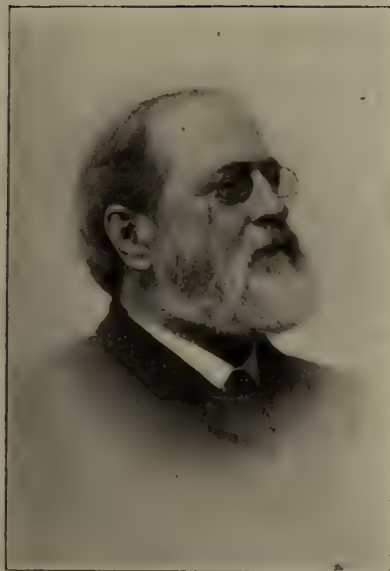
value of bread it is quite certain that we obtain a sum which really means nothing, as it neither represents the wheat nor the bread production.

Have we not the same meaningless result when, in a statistical table, we add finished products, like fine copper or nickel, with such raw materials as iron ore, coal, petroleum or natural gas, and also with such other furnace or manufactured products as pig iron, matte, steel, coke, illuminating oil, brick, cement, carbide or calcium, &c.? Evidently yes! Such a table as the above gives us a total which cannot possibly mean anything as it represents neither the production of our mines, nor the production of our smelting or other metallurgical works, nor the production of other manufactured products largely made up of minerals. The tables may be entitled "mineral production of Canada," or of Ontario, or of some other province, for such and such year, but in reality they are nothing of the kind and are simply additions of figures. It is indeed quite certain that fine nickel or copper are not ores or minerals not any more than pig iron, matte, steel, coke, brick, cement, tile, sewer pipe, &c. When therefore we state, for instance, that in 1900 the mineral production of Canada was 64 and a half millions (\$64,500,000) or that the mineral production of Ontario, in 1901, was \$11,800,000.00. We really make statements that are far from being accurate, in their true sense. In reality the mineral production of Canada or of Ontario were less in the years above named. But, what is much worse than somewhat exaggerated values, is that it is impossible to tell, from the tables, how much these mineral productions really were; and thus, we are left entirely in the dark by the very statistics, collected and compiled with so much care and expense, to give us the very information which finally is missing. For indeed, if we try to get at the true mineral production, by deducting from the tables the values of the fine metals, mattes, pig iron, steel, brick, cement, lime and all other manufactured products and by replacing these with the values of the corresponding raw materials at the mines or quarries, we cannot find these last, except in the case of iron ore, and thus, as we said above, we cannot arrive at the real value of the mineral production which is the very aim of all our efforts. The value of our mineral statistics, as now published, is therefore greatly lessened by the want of clearness in grouping so many classes of products (from the mine, the smelter, the brick yard, the cement mill, &c.) all into the one table. This system we submit should be done away with and replaced by the following:—

- 1st. Separate statistics of the first marketable products of our mines and quarries—spot values.
- 2nd. Separate statistics of the products of our smelting and metallurgical works—spot values.
- 3rd. Separate statistics of the products of other mills or works using ores or minerals as raw materials, such as petroleum refineries, cement mills, brick yards, lime kilns, &c.—spot values.

This is the system which has been followed for a great many years by most of the European countries, and it certainly presents, as we pointed out above, over the one now followed by us in Canada and by the United States Geological Survey, the advantages of: first, perfect clearness. Secondly, this system will also eliminate all fanciful values of fine metals, at New York or other markets. These market values might very well be considered and given as a matter of valuable information in a statistical report, but should never, in our opinion, form the basis of values in the tables as the spot values, at the mines or works, are certainly the vital points required to be brought out since they constitute the actual facts which alone can be recorded and which alone are really useful as representing existing conditions. Thirdly, it is a much more elastic system as under it the values of the raw products of the mines and quarries are first given, then the values of the more or less finished products of the smelting and other works are given in other tables, so that there need not be any more fear of repeti-





MR. S. M. ROBINS

Who was presented with an address by the citizens of Nanaimo, B.C., on retiring, after 20 years service, from the New Vancouver C.M. & L. Co.



THE LATE J. GEO. RUTHERFORD, M.A., M.E.



MR. PAUL JOHNSON

Who was banquetted this month on leaving the B.C. Copper Co.

The death of J. George Rutherford was a shock to his many friends. Only ten days before he had been with a number of colliery managers at Halifax who had noted with pleasure how much he enjoyed the reunion and who found it difficult to realize his health had been precarious.

He was the eldest son of John Rutherford, inspector of mines for Nova Scotia, 1866 to 1871, still a hale and hearty man, over 80 years of age. He was a brother of Colonel Rutherford of Ottawa. He was educated at King's College, Windsor, and studied mining in the North of England. After some experience at Sydney mines he became associated with his father at the Albion mines. In 1886 he became assistant manager to the Acadia Coal Co. and remained in their employ for 16 years. Just a year ago he left Stellarton to take charge of the Joggins Colliery, in Cumberland County, which he looked forward to modernizing and having it equipped for a greatly increased output. He leaves a widow and four young children of an age calling especially for a father's help. His very largely attended funeral at Stellarton showed how greatly he had been esteemed by the community there and the miners with whom he had dealings for so many years.



tion of values as in the present tables; and, the statistical analysis of the different industries; mining, metallurgical and allied industries can be pushed as far as desired, or convenient, or as far as it is possible to collect it.

### Some Possibilities of Mining in Canada.

By FREDERICK HOBART, New York.

No ordinary man can, without risk, assume the part of a prophet. It requires a wider knowledge of conditions than most men possess, to enable one to foresee the changes which may in a few years affect the course of an industry, the discoveries which may turn the current of trade, or make methods and processes obsolete. It is possible, however, to take the conjunction of certain conditions, and to base upon them a reasonable forecast of coming events.

The growth of the mining industry of Canada has been uneven; in which the country is not at all peculiar. It seems inevitable that in all countries, mining, especially of the precious metals, should have its periods of boom and depression. Like the individual mine, the industry generally is now in bonanza and again in borrasca. It is not easy, indeed it has thus far been impossible, to devise any method of equalizing matters and distributing prosperity evenly over the years. The economists who have studied the problem, have generally given it up in despair.

At present matters are, to all appearances, improving. The complications which stock speculation imposed upon some of the best mines in British Columbia, for instance, are in a fair way to be straightened out, and an opportunity will be given to show their real value. The Eastern Ontario mines have found a way to work their complex ores, and utilize the by products.

While the resources of Canada in the precious metals, in nickel and lead, are important parts of her mineral industry, it seems to an impartial observer that only a beginning has been made on the two branches of mining and metallurgy, which present the greatest possibilities for the future, iron and copper. To take the last named first, some remarkable work has been done in smelting the low-grade ores of British Columbia; but this seems to be really only a beginning, an indication of what may be done in the future. The extent of the deposits of ore and the proximity of fuel and other materials point to a much larger production in the future. There can be no doubt that a period of greater prosperity is promised for the copper smelters. The attempt to maintain the metal at abnormally high prices, and, after that policy had broken down, the effort to force a general combination of producers by depressing prices, have both proved unsuccessful. The copper market is now, for the first time in three years, in a normal condition, where the old law of supply and demand has full affect. The result is seen in the steady rise of prices since the opening of the present year. There is no doubt that the present consumption of the world is fully up to production, notwithstanding recent increases. The mines and smelters which have been able to maintain their production on the basis of 11 cents, can certainly prosper when 13 or 14 cents can be realized. This condition seems likely to be maintained for some time to come; and it will not only keep existing mines at work, but will stimulate the opening of new ones, and prospecting for other deposits. Canada is already an important copper producer, and will, without doubt, improve its position in this respect during the next few years.

In this connection, it might be of advantage to establish an electrolytic copper refinery at some convenient point, so that the product of the western mines could be put on the market as fine copper, ready to be sold at home or abroad, instead of selling and shipping converter bars or standard copper, to be refined elsewhere. The output of the

British Columbia mines will soon be large enough to warrant this—if it is not so already. It would seem that this suggestion is worth consideration.

The greatest opportunity for development in the near future, however, seems to lie in the direction of iron and steel production. These industries have, as we know, grown with unprecedented rapidity during the past two or three years. While this growth has been largely due to the energy and success of the Dominion Iron & Steel Company, it looks as if that Company were only a pioneer in the trade, and would undoubtedly have many followers.

Canada has great resources in this line. It is hardly necessary to call attention to the iron ores of Nova Scotia and the east. In the centre, the recent discoveries on the Hutton Range, which I understand are to be described by an expert at this meeting, show that the anticipation of important iron ore deposits in Western Ontario, within convenient reach of lake navigation, are to be fulfilled. The mines of Eastern Ontario have been described by Professor Miller and others. The ores of the coast districts of British Columbia are still to be developed, but they exist in quantity; while other deposits in that Province were well described at the last meeting. The raw material is abundant, and on the eastern and western coasts alike, coal and coke are within reasonable distance. The modern tendency is to carry the ore to the fuel, rather than the fuel to the ore. Every reduction in the distance required for such carriage is a distinct economical gain.

In considering this question of raw materials, I may venture to suggest the hope that Canada, by legislation or otherwise, will be able to avoid the serious economic mistake which is now being made in the United States. The supply of raw materials is, as we all know, the life of any trade. The control of the iron ore supplies of the United States is quietly, but steadily, passing into the hands of the United States Steel Corporation, and practically no effort has been made to prevent it. The big corporation is seeking to control the trade, not by absorbing its rivals, so much as by putting them in a position where they will be dependent upon it for the material which they must have, if they are to exist at all. The enormous power which will thus be concentrated in the hands of one board of managers can only be appreciated in part now, since a similar condition has never before existed. To repeat, it is to be hoped that in Canada the mistake of allowing the control of a great industry to be held by one corporation will be avoided in time. The economic danger is great enough to over-balance any possible temporary advantage.

From the trade point of view, Canada is exceptionally well placed for a large development in the mining of iron ores, and the manufacture of iron and steel. The home demand is bound to increase steadily with the growth of population and business, and the belief in industrial independence. Beyond this, Canada's position will enable its manufacturers to take the fullest advantage of foreign markets. The eastern mills and furnaces have already begun to sell in British markets to advantage, as well as in those of the United States. They are well situated also to secure a share of West Indian and South American trade, and will doubtless do so before long. On the western coast the establishment of iron manufacture will enable Canada to compete—I believe with success—for the supply of iron and steel to Eastern Asia, and probably Australia also; while there is nothing to prevent the capture of the trade of the entire Pacific Coast. British Columbia has the most important supplies of iron ore and the only good coking coal on the coast; advantages which will surely be realized before long.

The Geological Survey and the Mining Bureaus of the different provinces have thus far rendered aid to the mining industry in various ways, though not all that has been demanded. The Ontario Bureau has given much attention to the iron ore deposits, and its example might well be followed elsewhere. The encouragement of iron mining



and manufacture by economic legislation is a matter outside of this paper, but will doubtless be well considered.

I have not attempted to go into details; the subject is too large for that. I have simply attempted to outline what seem to be the directions in which the Canadian mining industries will grow during the next few years. Iron and copper will, it seems probable, be the chief points of development; but this will not exclude progress in other directions, for which I look, and for which I hope.

### The Modern Blast Furnace Laboratory and its Work.

BY W. DIXON CRAIG, Midland, Ont.

The history of the last half century has been largely the history of industrial chemistry and in no branch of manufacture has chemistry played a more important role than in the manufacture of iron and steel. I should preface this paper by stating that it aims at being popular rather than technical in the hope of interesting a larger audience.

Following the logical order, we shall first then consider the work of the laboratory, and later, the laboratory itself.

The work of the blast furnace laboratory falls naturally into three sections: analysis of raw materials, analysis of product, and analysis conducted for furnace control; the analysis of both the raw material and the product are also, as will be seen below, absolutely necessary for control of the furnace.

Although the knowledge of the chemical reactions which take place inside the furnace has not been reduced to the exact a science as the knowledge of some other processes, nevertheless it is quite allowable to say that we know enough of these reactions to afford definite guidance in the burdening a furnace. The problem of burdening a furnace may be stated thus—Given ore, coke and limestone—in what proportions shall they be put into the furnace in order, 1st, to make iron, and 2nd, to make iron suitable for a certain purpose? By purely empirical juggling with these various constituents good suitable iron has been made. But to get constant results, we must know the constituents of the raw materials. If iron ore were pure iron oxide, limestone pure carbonate of lime and coke pure carbon, one analysis would suffice forever. But iron ores are as varied as human nature and limestones are strikingly different, not only in different localities but in different beds of the same quarry, while cokes are also of many descriptions.

Before the furnace can be properly burdened then, it is necessary to have a full analysis of the ore, limestone and coke used.

The constituents generally determined in an iron ore are metallic iron, silica, phosphorus, manganese, alumina, lime, magnesia, sulphur and moisture. Special ores often require further special determinations. Each ore in use is analyzed once a week for the more variable constituents, and at certain intervals completely.

Similarly, the limestone is run every week for iron, silica, alumina, lime, magnesia, and occasionally, for sulphur and phosphorus.

Coke is tested for sulphur every day, and at stated intervals analyzed for moisture, volatile, fixed carbon, ash, iron, silica, alumina, lime and magnesia.

I need scarcely point out that the samples of these various materials must be taken very carefully or the analysis will not represent the stock accurately and will consequently be worthless.

We see then, that before any material is allowed to enter the furnace, it is subjected to a chemical analysis. Of course, some ores are more desirable than others, generally because they are richer in iron. Other ores again, are useless on account of high percentages

of sulphur. Still others are most desirable for making bessemer iron on account of their low phosphorus content. It has thus come about that ores are bought and sold on chemical analysis. The furnace laboratory is, then, called upon to sample and test the ore received, to see if it comes up to specifications. Every cargo or carload of ore received is sampled and tested completely. The selection of a sample from a large cargo of ore thus becomes a very important matter. It may not be out of place here to state that the largest cargo of ore received at a Canadian port arrived in Midland, on Nov. 22nd, 1902, per the Agawa, of the Algoma Central Steamship Line.

In the same manner and for the same reasons, the limestone and coke received must be tested by the laboratory to make sure that they come up to the requirements.

The analysis of the product of the furnace—pig iron—is just as important as the analysis of the raw material. Iron is still very generally graded by fracture, but chemical analysis is coming to be regarded more and more every day as the most reliable test of the quality of pig iron.

The largest consumers of pig iron buy on chemical specifications. In making bessemer steel, an analysis of the pig iron used is absolutely necessary if a uniform steel is to be produced. However, it is not my intention to make *ex cathedra* statements as to the relative merits of grading by analysis and grading by fracture. The question is still a more or less controverted one. I would, however, point out the folly of regarding chemical and physical tests as opposed to each other. Chemistry and physics are mere arbitrary terms used by us to define our ignorance. No one science is separate and distinct. Our object is to know all that is to be known about a certain iron. The great advantage that the knowledge gained by chemical analysis has over the knowledge gained by inspection of the fracture is that the former is definite and unprejudiced while the latter is empirical and depends largely upon the grader's opinions and judgement.

When we come to consider the analysis of the iron as a factor in the control of the furnace, we see how important it is. Every cast is analyzed with the utmost speed in order that the man in charge of the furnace may know what kind of iron has been made, and thus what he must do to get the same iron next cast, or to improve the grade of the next cast. Every cast is analyzed for silicon and sulphur, and phosphorus and manganese are determined in a certain number of casts depending on what kind of iron is being made.

The result of the analysis is in the hands of the furnace superintendent long before the iron is cooled. Half an hour always suffices for analysis. Many casts are run in far less time than this. If the furnace superintendent had to depend upon the fracture of the iron for his knowledge, he would have to wait considerably longer and thus make his changes so much later.

Every pound of iron produced is thus analyzed for the purpose of affording guidance in the running of the furnace and supplying the market intelligently.

Already it is the custom with all large consumers of pig iron in the United States to buy strictly on chemical analysis. This practice is spreading and it is only a matter of time before most of our Canadian consumers will follow suit. The advantages of this are apparent at a glance. The foundryman or steel maker, knowing the character of his stock, can order iron of the most suitable analysis. He can test closely the iron he receives, thus making sure he is getting what he is paying for. On the other hand, the manufacturer of iron is relieved of all responsibility after supplying the desired iron, and runs no risk of having his iron blamed for bad results which are due to another brand.



While pig iron is the product proper of the blast furnace, it also produces two other materials—slag and gas.

A knowledge of the chemical nature of the slag is of great assistance to the furnace superintendent. While this can be estimated roughly by its appearance, it is usual to have a sample taken from every flush, and an average sample made up from these to represent the twenty-four hours—thus checking the work of the furnace. To illustrate the value of this—A certain burden is put on the surface, calculated from the latest analyses at hand; by calculation, the slag should have a silica content of 32 per cent. After twenty-four hours running, the slag is analyzed and found to run thirty-six per cent. in silica. It is needless to remark here that this will have a considerable effect on the iron produced. Knowing the analysis of the slag, it is a simple matter to calculate just how much more limestone should be added to the burden to bring the silica back to thirty-two per cent. In this way close watch may be kept on the furnace. The slag is analyzed every twenty-four hours for silica, alumina and lime. The gas is more rarely tested. A knowledge of its composition, however, often affords a valuable aid to the control of the furnace.

I now give some detailed notes on some of the methods of chemical analysis used in the Midland Laboratory.

#### PIG IRON.

*Silicon.*—Textor's Chromic Acid Modification of Drown's Method.

To one gram of drillings in a number 4 casserole add 15 to 20 c.c. of water; then 25 c.c. Silicon. Mixture. (1 part Sulphuric Acid, 1.84 specific gravity, 2 parts Nitric Acid, specific gravity 1.20), heat over a small Bunsen flame till dissolved or violent action ceases and evaporate rapidly over full Bunsen flame without use of gauze or asbestos board. When the solution has evaporated sufficiently, the iron sulphate becomes insoluble and is thrown up against the cover glass. Remove from the lamp and while hot add 15 c.c. of a water solution of chromic acid, (120 grams to a litre of water), boil again as before, until the chromic acid Crystallizes out. Remove from lamp, add hot water, slowly at first, boil a few minutes or till dissolved and clear; filter. Wash the chromic acid out of the filter with hot water, then wash with warm dilute hydrochloric and lastly three or four times with hot water. Ignite and weigh. *Precaution.* The evaporation with chromic acid must not be carried too far, otherwise insoluble salts are formed. On the other hand, if the heat is not continued long enough, the graphite will not all be oxidized. The small amount of graphite occasionally remaining is very quickly burned off in the ignition.

I have given the above method in detail as it is not very well known and is an extremely rapid method for pig iron. It is very accurate and simple. Determinations in our laboratory are run regularly in 20 to 30 minutes

*Sulphur.*—The evolution method is employed. The iron is treated with dilute hydrochloric acid. The sulphur is evolved as hydrogen sulphide, which is collected in an ammoniacal solution of cadmium chloride. The precipitate of cadmium sulphide is finally dissolved and the solution titrated with standard iodine solution, standardized by a standard iron. Some improvements on and modifications of this method are now being tested in the laboratory.

*Phosphorus.*—Emmerton's method is used as given by Blair. (1) The standard solution employed is standardized by a standard iron.

*Manganese.*—A modification of Volhard's method (2) is in use at present. A new method is being thoroughly tested, and if accurate, will be adopted. (3)

*Graphite.*—Method as given by Blair. (1.)

*Combined Carbon.*—Eggertz Color Method. (2.)

In four of the above methods a standard iron is necessary. The standardized drillings of the American Foundrymen's Association are used, and one cannot speak in too high praise of the enterprise and thoughtfulness of this association in preparing this laboratory necessity in such an admirable manner.

#### ORES.

*Metallic Iron.*—Solution in hydrochloric acid, reduction with stannous chloride and titration with potassium bichromate. (3).

*Phosphorus.*—The ore is brought into a nitric acid solution, the insoluble residue being fused, if necessary, and then determined as in pig iron, except when titanium is present—*vide infra*.

*Manganese.*—The ore is brought into nitric acid solution, the insoluble residue being fused, if necessary, and then determined as in pig iron.

*Sulphur.*—The *Aqua Regia* method is used. I would note here the importance of two points in this method—a double evaporation to dryness before the insoluble residue is filtered off, and secondly, after precipitation by barium chloride, the evaporation of the solution to very small bulk in order to drive off the acid and render the barium sulphate completely insoluble. These two points are often overlooked.

*Silica.*—The ordinary separation by evaporation is used. The ore is decomposed in hydrochloric acid, filtered, the residue fused and the fusion dissolved in the filtrate. This solution is evaporated to bone dryness, taken up in hot-water and hydrochloric acid, filtered, and the filtrate evaporated to dryness, dissolved and again filtered as recommended by Hillebrand. (4) The two residues are ignited and weighed as Silica.

*Alumina.*—The alumina, lime and magnesia are in the filtrate from the silica. The alumina may be separated by the basic acetate or ammonia separation. The precipitate of ferric oxide and alumina is dissolved in dilute hydrochloric acid and the alumina precipitated from this solution as aluminum phosphate by Camp's Method. (5)

*Lime and Magnesia.*—Are determined by ordinary methods. (6)

*Titanium.*—This determination is generally required in ores in which phosphorus occurs. Gooch's method is used. (7) Many of the methods recommended for the determination of titanium and phosphorus are unreliable because they fail to make a complete separation.

*Limestones.*—The ordinary methods (8) are used. The same precaution is adopted in determining the silica as in ores. Lime is determined by titration with potassium permanganate.

*Coke.*—The ordinary methods are used. Sulphur is determined by the fusion method. Eschka's method has been used, but in our experience, cannot be fully relied upon.

*Slag.*—Ordinary methods are used, very similar to those used for limestone. I have given above a short *resume* of the analytical methods employed for iron work in the Midland Laboratory. It should be understood that new methods are being looked for always and tested as to their desirability. Details of these methods can, of course, be found in the references.

It may be of interest to note that a committee of the American

(1) "Chemical Analysis of Iron."—Blair.

(2) "Chemical Analysis of Iron."—Blair.

(3) "Journal Amer. Chem. Sec. XXIV, 1204."

(1) "Chemical Analysis of Iron."—Blair.

(2) "Chemical Analysis of Iron."—Blair.

(3) "Chemical Analysis of Iron."—Blair.

(4) "Journal American Chemical Society. XXIV. 562."

(5) "Methods of Iron Analysis."—Phillips.

(6) "Chemical Analysis of Iron."—Blair.

(7) "Chemical Analysis of Iron."—Blair.

(8) "Chemical Analysis of Iron."—Blair.



Foundrymen's Association is at present at work on the selection of standard methods for the analysis of pig iron and that this laboratory is participating in this work.

I should now like to say a few words on the relation between the Canadian Mining Institute and the work of the Blast Furnace Laboratory.

Granted that the iron industry of Canada has a future of importance, it behooves this Institute to keep in close touch with it, and hence with the laboratory and its work. I have referred above to the work of the American Foundrymen's Association. This body has prepared a set of four standardized drillings which have proven of inestimable value to iron chemists and the iron industry at large. They have also put forward a standard method of sampling pig iron which is now on trial. As stated above, a committee of the association is now at work on the selection of standard methods for the analysis of pig iron.

The American Chemical Society also, has published valuable standard methods for the analysis of coal and coke.

Now, while Canadian chemists profit by this work, I look forward to the time when these matters may be controlled by a Canadian Society.

While it would be too much to expect the Institute to take up this work at the present time, there is a need which it might meet.

A standard iron ore would be of great value in a furnace laboratory and in many other directions. Prepared by the Canadian Mining Institute, it would be a reliable standard for use all over Canada. At the same time, it would be a start in the right direction. The Canadian Government might reasonably be expected to assist in this, as the matter concerns it in the analysis of iron ores required in connection with the bounty on pig iron.

Another work which would be of value is the selection of a standard method of sampling ore cargoes and car shipments. This would result in the avoidance of disputes between buyer and seller.

One further suggestion I would throw out before leaving this subject—the formation of a chemical section of the Institute. While probably many Canadian chemists are, like myself, members of the American Chemical Society or the Society of Chemical Industry, I believe that a section devoted to mining and metallurgical chemistry would be welcomed by those chemists who are already members of the Institute, and might result in the acquisition of new members. This section might be allowed to hold a one day's or a half day's session at the meetings of the Institute in which technical papers could be read. I believe this would assist in making the Institute the premier Canadian Society.

I do not elaborate further on these points as I hope they will call forth valuable discussion, giving the Institute more weighty opinions than my own.

Having taken up the work of the laboratory, I now turn to the laboratory itself. As far as this subject goes, I cannot do better than give a description of the Canada Iron Furnace Company's Laboratory at Midland.

The Laboratory is situated on the hill, back of the furnace plant, over-looking Midland Bay. Being some distance from the furnace, it is as free from dust and vibration as possible. Every chemist will understand what a valuable consideration this is. The building faces south and is 30 x 40 feet and from 30 to 40 feet in height. It is constructed of solid brick, with granite foundations and trimmings. The most noticeable point from an exterior view is the large amount of window space. On the south aspect, or front of the building are two large windows, each subdivided, and a glass paneled entrance. The other three sides of the building are provided with two windows each.

There are three entrances to the building. In the front is a spacious porch and double doors leading into the hall or vestibule. On the north or rear wall is another half glass door, for the convenience of the laboratory staff. At the east side of the building is the basement entrance for the reception of fuel and laboratory supplies. The main entrance and all the windows are provided with awnings for the summer season.

The draught stack appends in the centre of the roof, which is constructed of fire proof cement. The general design of the building is similar to that of the other permanent buildings on the plant.

The main entrance leads into the hall, from which doors open into the office and laboratory proper. A fire extinguisher is kept in the hall in case of emergency.

The door leading into the office is provided with a glass panel bearing the initials of the company—C. I. F. The laboratory door is private and is the only door on the main floor entirely constructed of wood. An oak wainscoting runs around the wall; this is continued in all the other rooms, the laboratory included.

The office, which is 13½ by 15 feet is intended for the use of the chief chemist, and for the housing of the mineral collection which is maintained in connection with the Exploration Department. In this collection are specimens of ores, chiefly those of iron, from all parts of Canada, more especially of Ontario. Specimens are being added to this constantly. The nucleus of a technical library is also kept here. It is the intention to gather about this an extensive collection of geological and chemical works. The windows of the room look on the south and west and command a complete view of the plant. A private telephone connects with the other departments. A glass paneled door opens from the office into the laboratory. The three front rooms, office, hall and balance room, are separated from the main part of the building by a ceiling and walls 16½ feet high. As the roof of the building constitutes the ceiling of the laboratory, there is a considerable amount of space above these rooms. The walls of the laboratory are 20 feet in height; above this the roof slopes from all sides to the apex, which is 30 feet from the floor. The roof is supported by two trusses and suitably finished with a wood ceiling. There are two ventilators placed in the roof for carrying off foul air and any stray fumes. The shape of the roof, admirably adapted for the collection of fumes, and its extreme height, are very important factors in keeping the laboratory atmosphere pure. The room is 14½ by 38½ feet.

In the center of the building, and consequently on the south side of the laboratory, the draught stack rises. The fume cupboard, or hood, is built around three sides of this. It is 9¼ feet long by 4½ feet wide. The total height is 13 feet and the walls are 9 feet high.

It is provided with a two inch blast pipe from the furnace blowing engines, running up the inside and into the opening into the draught stack. This provides a perfect forced draught. All operations in which noxious fumes are produced are conducted under this hood and the fumes instantly removed by the strong draft. The working surface of the hood is a heavy slate slab entirely unaffected by any acids which may be spilled on it. The hood is made of solid, polished oak and forms a very handsome piece of laboratory furniture. Below the slate slab is a large locker. The hood is fitted with twelve gas cocks and provided with a large hot plate 19½ x 22½ inches, and one large ideal gas burner providing a second smaller hot plate. Inside the hood are two small shelves for the reagents used in running the casts for silicon. The sashes of the hood may be raised or lowered at pleasure. At either end, just outside the window sashes, is an electric lamp.

The work tables run along the walls of the room, just below the windows. These are 30 inches wide and 3 feet high; there are 54 running feet of working space. There are two windows on the north



side and one at each end of the room. Thus, every table but one has a window immediately over it. There are five tables, one at each end, two on the north side and one on the south side, against the office. Over the latter is a set of shelves for glassware and chemicals. The table tops are of wood, painted black and waxed with paraffin for protection against acids. This description of tables has been found very satisfactory.

Along the inner side run three sets of pipes with cocks at intervals.

One of these pipes is for gas. The second comes from the blast pipe in the basement which leads from the blowing engines; this provides blast for the blast lamps. The third pipe comes from a very powerful filter pump in the basement, producing suction for rapid filtration. Thus, by simply opening a cock, gas, blast or suction can be obtained at different places on each table. These pipes are boxed in, forming a small shelf at the back of each table for apparatus and work under way. Above this shelf is a second one of plate glass, running along above each table, for reagent bottles. A plate glass shelf can always be kept clean, which is impossible in a wooden shelf on which reagent bottles are kept.

Above each table hang two electric lamps for night work. Under each window, below the table, is a large hot water radiator. The tables are provided fully with drawers and lockers of oak.

At the east end, on the south side of the room, is the door leading to the basement stairs, which are closed in by an oak closet. On the top of this closet is kept a carboy of distilled water. At one end of this closet is the sink and draining shelves for glassware.

The situation of this work room on the north side of the building obviates much trouble from direct sunlight, while its shape, long and narrow, and the large windows, ensures perfect light in all parts of the room. The loftiness of the ceiling keeps the atmosphere as clear as is possible in a busy laboratory.

South of the laboratory, at the east end of the building, is the balance room, which is entered by a swing door with glass panels. It

has windows on the two sides of it. In the middle of the room is a concrete pier, separate from the floor and resting on its own foundation in the basement. This prevents any jarring of the balances. This pier is cased in paneled oak and on the top is a polished oak slab  $3\frac{1}{2}$  feet by  $5\frac{3}{4}$  feet for the balances. There are two Becker and one English balance, and a pair of counter scales on this table. Each balance is provided with an electric lamp. The position of the table, in the center of the room, is to be recommended on account of the advantages of having the light come from behind while weighing. The windows are provided with sash curtains for keeping direct sunlight off the balances, while at the same time not shutting off the light entirely from the room.

On the north side of the room stands a Buffalo Testing Machine for making physical tests on the pig iron. The room is also provided with a wash stand, desk and hot water radiator.

The whole building is floored with maple, and finish throughout with oak.

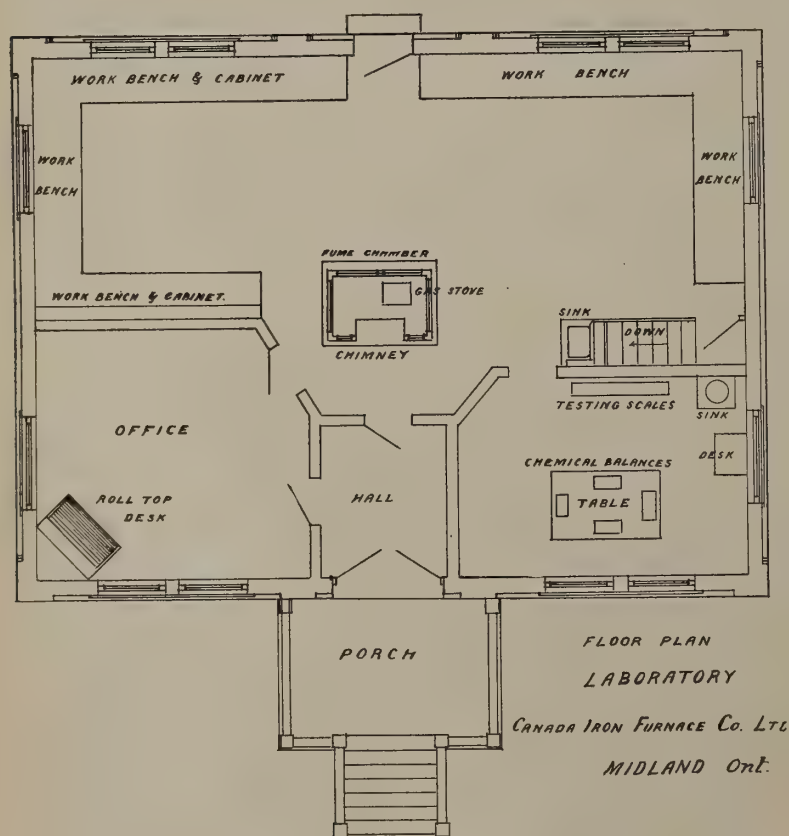
Gas is obtained from a 50 light gas machine of the Detroit Heating and Lighting Co. This has given perfect satisfaction and is exactly the equivalent of city gas in point of convenience.

The basement is the full length and width of the building. In one corner is a store room for supplies and chemicals, in which the gas machine is kept. A Preston boiler for hot water heating is placed beside the base of the stack. In another corner of the room is the concrete pier for the balance table.

There are five sets of pipes in the basement—for hot water heating, gas, water, blast and suction. There are three windows and a door, referred to above. The floor is of concrete and cement.

I should explain that the equipment for handling samples is in the machine shop. A steam power sample crusher, grinding mortars, steam bath, mixing floor, etc., provide facilities for handling very large samples of over a ton, as well as smaller ones.

Altogether, it may be said that this laboratory is one of the finest in America. Its situation, design and finish would be hard to improve upon. It was designed by Mr. John J. Drummond, General Superintendent of the Company, built by Foreman Mr. George Beatty, now Superintendent of the Londonderry Iron & Mining Co., Londonderry, N. S., the writer being responsible for many of the details. I may best conclude this sketch by saying that the character of this laboratory is one of the hopeful features in regarding the future of industrial chemistry in Canada.



#### Air Compression by Water Power: The Installation at the Belmont Gold Mine.

By D. G. KERR, C. & M.E., Deloro, Ont.

This water power is situated in the township of Belmont, county of Peterborough, Ontario, about three miles in a north-west direction from the Belmont Gold Mine.

On the outlet of Deer Lake there are falls and rapids which give a head of 75 feet in a distance of 1600 feet. Still further down the river there is another drop of 25 feet, all being on the property of The Belmont Gold Mine, Limited, Cordova, Ontario.

Deer Lake is about four miles long by a mile wide and holds a splendid reserve of water for the dry season. The lake is fed by a chain of smaller ones which extend north about 100 miles. This makes an ideal situation for a power plant.

After the power was acquired the question was electricity or compressed air. The generation and transmission of electricity would have cost less at the power house and to the Mine, but it would have been necessary to have put up a motor driven air compressor at the

may seem superfluous to say that a swing door for the balance room is a wonderful convenience, but it is surprising to know that many laboratories lack this feature. The room is  $15\frac{1}{2}$  feet by  $8\frac{3}{4}$  feet and



AIR COMPRESSION BY WATER AT BELMONT MINE.



Lower part of Flume and Power House—Belmont Gold Mine.



Centre of Flume Pipe—Belmont Gold Mine.



## AIR COMPRESSION BY WATER AT BELMONT MINE.



Power House, showing Tail Race and Air Pipe leading to Belmont Gold Mine.



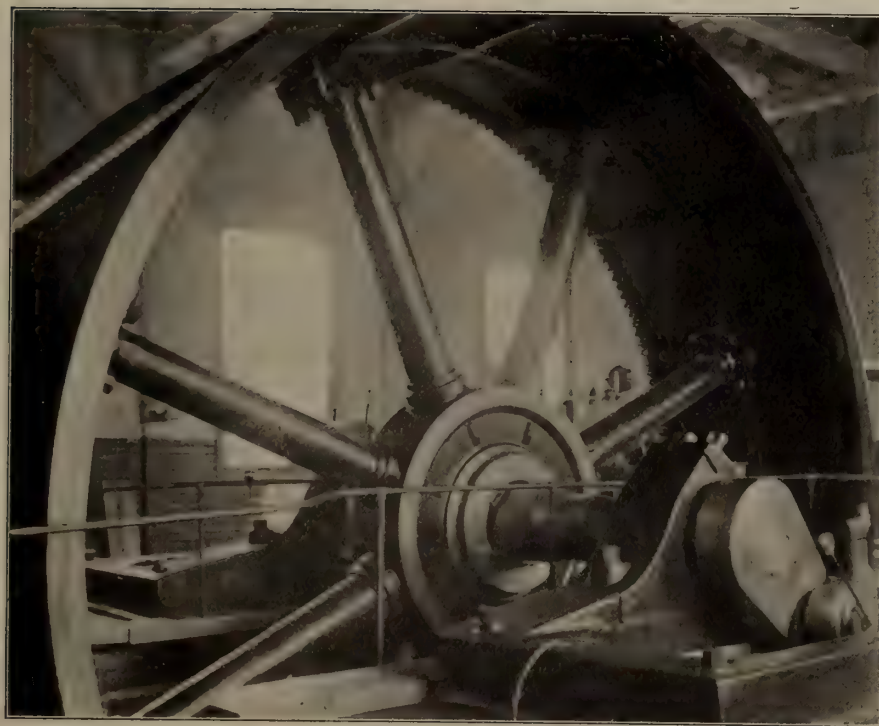
Flume Pipe. Upper part Dam in the distance.



AIR COMPRESSION BY WATER AT BELMONT MINE.



Water Wheel Section, Rope Pulley in motion—Belmont Gold Mine.



Rope Wheel on Compressor—Belmont Gold Mine.



Mine to supply drills with air, and motors at hoists and engines. This would have brought the first cost of the electric installation to a higher figure than one large air compressor plant, besides, the attendance, etc., at the motor driven compressor at the mine would swell the working costs. By installing one large air compressor at water-power and carrying the compressed air in pipes to the mine, branching it off in all directions to the shafts and mill, without having to make any alterations on any of the engines or hoists, all that was then required to be done was to shut off steam and turn on air to the engines, hoists and pumps without any loss of time when air was turned on at power plant. This left the steam plant; boilers, etc., with all their connections as a good reserve power in the event of anything going wrong with the air power. In this arrangement, it permits the using of machinery which was comparatively new, being only two or three years old.

One important point was the getting in of an air compressor plant large enough to do the mine work for a long time to come. As the underground requirements for air increased there could be more power developed at the falls by electricity to work the surface machinery. Then would be the time for considering the motor driven machinery as by that time the proper size of machinery for handling the quantity of ore would be better understood.

The outlet of Deer Lake was formerly by two channels, 300 feet apart, through a fine grained Diorite rock. The south channel was closed with a concrete and cement masonry dam, 85 feet long, 9 feet wide at top and 16 feet at base and 15 feet deep at the greatest part. On top of the dam are small piers 18 feet apart for bridging with timbers for a passage across. Underneath this and over the top of the dam the surplus water goes when stop logs are in at the slide way on the north dam. The north dam is 75 feet long with a 25 foot slide for the passage of logs. In front of the north side is a forebay with a 30 foot rack. This is where the water is taken out of the lake for the power, through a 7 foot square opening in the dam with a gate on the side next to the lake. The gate is worked by means of a rack and pinion wheels wrought by worm shaft and wheel. The water intake to the flume is reduced from 7 feet square to cylindrical by means of steel work with flanges and fasteners for the wooden staves of flume pipe. On top of the dam, behind the gate and going down into the water entrance of the flume pipe is a man or air hole. Without such, the shutting down of gate at the dam, allowing the water to pass through the wheel, would create a vacuum in the flume, causing a tendency to collapse or disturbance to staves, resulting in much trouble and annoyance through leaks when water was turned on again.

The flume pipe is 1,550 feet long, 6 feet internal diameter and made of  $2\frac{1}{2}$  inch. pine staves,  $6\frac{1}{4}$  inches wide, radial edges, butt joints with saw drafts cut 2 inches into both ends into which was placed a steel plate  $\frac{1}{4}$  of an inch wider than the stave to embed into the staves on both sides. No two joints come together, but at irregular intervals, the staves being cut in 12, 14, 16 and 18 foot lengths and clamped with 2000 3-16 x 2 inch steel bands and fastened with grip fasteners. The pipe is carried on 12 inch square timbers circled out to take the outside circle of the flume, and these bearer timbers are placed 8 feet apart, centre to centre. The steel bands are spaced 3 inches apart at the lower end and 24 inches at the top. There are two curves in the flume of  $20^\circ$  each. The  $6\frac{1}{4}$  inch staves were too wide and rigid to be sprung into place on the top of the flume, so  $\frac{1}{3}$  of the top staves going round the curves were made  $3\frac{1}{8}$  inches wide.

The bed for the flume was cut through ridges of rock for the first 900 feet from the dam, 3,960 cubic yards of rock excavation being done by steam drill in the winter season. At the lower end there is 217 cubic yards of stone piers to carry the flume over a low piece of ground before arriving at the power-house, and inside of the power-house a steel tube takes the place of wooden staves.

The cost of the wooden flume, made of pine, came out at \$3.00

per foot, while the estimated price for this length of steel (flume only) was \$15.00 per foot. The power-house building lies north and south and the part which contains the compressor is 40 x 50 feet. South of this is a cooler room 43 x 16 feet, and north of the main part is the water wheel part, 64 x 35 feet. The water-wheel is a double 50 inch bronze Leffel wheel with double discharge and running at 210 revolutions has a capacity of 800 horse-power, taking 7,500 cubic feet of water per minute. The water gates of the wheel are made of cast steel, and the casing of  $\frac{1}{2}$  inch steel plates with cast iron heads. The water-wheel is carried on a steel shaft which extends at one end for the transmission of the power by means of a rope pulley, 5 inches in diameter and 6 feet 4 inches wide across the face, with 30 grooves for 30,  $1\frac{3}{4}$  inch cotton ropes. On the top of wheel casing is a dome 2 feet in diameter by 10 feet high with valve, and just above this valve are two pipes, 12 inches in diameter, having spring valves and leading into draught tubes. This is an arrangement for the relief of undue pressures from water ram, such as might be caused by the water-wheel gates on a long flume through which water is travelling at a certain rate, being shut down quickly. This arrangement takes the place of a stand pipe; costs less and there is no danger of its freezing as it is all under cover. On wheel case is a gauge showing water pressure and head in feet, and on draught tube is a vacuum gauge giving the vacuum in inches. The water-wheel, wheel casing, etc., were furnished by The Wm. Hamilton Mfg. Co., Peterboro.

Underneath the wheel is the tail sump, and from that the tail race going into the river. This was excavated out of solid rock to a depth of 20 feet and has cement masonry walls with steel beams and bolts with which the wheel casing is held in place. This tail sump is carried west underneath wheel to take the water from another wheel of 350 horse-power for which there is provision for water made on the steel part of flume by means of a tee piece. When this other wheel is at work the water velocity through the 6 foot flume will be brought up to about 10 feet per second. The intention is to develop this 350 horse-power with a direct driven dynamo, alternating current.

The air compressor which is driven by these 30,  $1\frac{3}{4}$  inch cotton ropes from pulley on water wheel shaft is one of Walker Brothers', (Wigan, England), Patent Air compressors; compound horizontal principle; high pressure cylinder, 30 inches diameter; low pressure cylinders, 48 inches diameter and with a 4 foot stroke. The cylinders are water jacketed, provided with improved accessible inlet valves and fitted with mottallic packing on the piston rods. It is rope driven by means of a 20 foot pulley, 6 feet 4 inches across the face, weighing 60,500 lbs. and built in sections on massive concrete and cement foundations, 14 inches high. Running at 65 revolutions, or a piston speed of 520 feet per minute, it will have a capacity of 6,500 cubic feet of free air per minute.

The low pressure air cylinder intake is connected together by branch pipe from the 3 foot pipe to the atmosphere outside. This 3 foot pipe lies horizontal on the top of the low pressure air cylinder, one end going to the south and the other to the west end of the building. The air is compressed in the low pressure cylinder to 30 lbs. pressure and is then discharged through a 14 inch pipe to the intercooler, and from there after being cooled, to the high pressure cylinder from which after being compressed to a pressure of 100 lbs. per square inch, it passes into the after-cooler. The inter-cooler and after-cooler are filled with brass tubes through which flows cold water and the compressed air passes and repasses over the outside of the tubes and is cooled down to within  $10^\circ$  of the temperature of the water used. In this cooling process there is considerable moisture deposited, as it is only by cooling the air to the lowest temperature that a high extraction of the moisture can be had.

The air leaves the after-cooler through a 12 inch pipe or ordinary oil well casing, having fine screwed couplings and tested to 600 lbs.



pressure. Half a mile out from the compressor is an air receiver to collect any moisture which may have passed the after-cooler. This moisture is drawn off every day.

The 12 inch pipe line from the compressor to the Mine is 15,000 feet long. At the end of this pipe line at the Mine is another air receiver to collect any moisture which may have been carried into the pipe line. The only time of the year that any moisture is expected to be carried this length, is when spring sets in and the heat of the sun frees any moisture from the inside of the pipe. This will be very little as the air receiver near the compressor is in a low swamp, and the air line leaving it for the Mine has a gradual raise of 50 feet in the 2,000 feet, thus draining moisture back into the receiver. The pipe line has 18 expansion joints and is mostly all buried in sand to prevent expansion and contraction.

The foregoing is only a slight description of the plant. As it was only started running in August 1902, and has not been run up to its full capacity yet, the loss in pressure due to friction in transmission cannot very well be arrived at. The loss at present is less than 1 lb., but using the full quantity of air the loss is expected to be  $3\frac{1}{2}$  lbs. What I would like to have completed, but found impossible in the short time that the plant has been running, is a complete comparison between summer and winter of the temperature at which the air is taken into the compressor, the amount of moisture extracted and the temperature of water used in coolers.

During the past winter there was only one shut down owing to freezing. This was caused by the moisture in the receiver half a mile out from the compressor being allowed to freeze through not being drained off every day. The ice formed in a honey-comb form until it interfered with the air pressure at the Mine, reducing same to 65 lbs. while there was 105 lbs. at the compressor. Shut down and found the receiver full of this honey-comb ice. After taking out same, started up again and covered up the receiver with a shed, banked so as to keep off the intense frosts and permitting the moisture to be drained off.

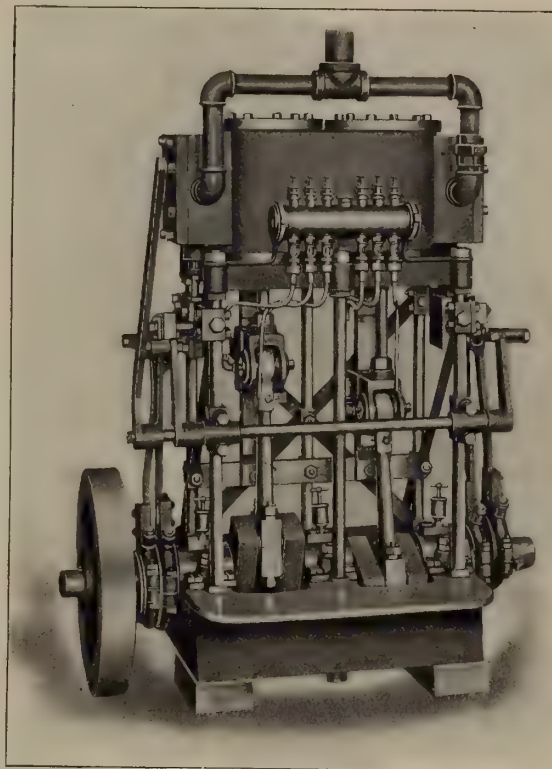
At the Mine I have had no trouble with freezing up except with a Corliss engine and a 14 inch Duplex pump. I find that engines with slide valves give no trouble, due to non-expansion of air inside of cylinder.

### The Stewart River Gold Dredge.

By A. W. ROBINSON, Montreal.

This dredge was built in 1902 from the writer's designs for Mr. William Ogilvie, Ex-Governor of the Yukon for this development of claims on the Stewart River Yukon. The hull was built and machinery erected by Mr. W. M. Ogilvie, and the machinery was supplied complete by the writer under contract for a lump sum. This dredge is a special design for exploration purposes being very light and strong and capable of working to a depth of 25 feet. It nevertheless has sufficient capacity to enable it to do effective work and to handle free material at the rate of 75 cubic yards per hour. In this way if there is any reasonable amount of gold in the ground to be prospected it can be made to pay although, of course, its earning powers will not be so great as a dredge of larger capacity. For the development of our northern rivers the writer believes it to be good policy not to make a very heavy investment at the outset in a large expensive dredge until the paying qualities of the ground have been thoroughly demonstrated. There is undoubtedly a need for a light and strong dredge of this type which will be primarily a prospecting dredge, which can be built and placed on the property for a comparatively small amount of money, and yet has the strength and capacity to enable it to make money if money exists.

The writer believes that the class of machinery that has heretofore been built for work of this kind has been entirely too heavy and cumbersome to send to such remote regions where the cost of freight is so high and the loss from breakdowns is great. This is due to the fact largely that the dredges have been built by manufacturers who naturally put into the machine the class of materials and workmanship which suited them best, and which may not have been in all cases to the interest of the purchaser and user. The Stewart River Dredge is designed and built entirely in the interest of the purchaser and user and it is as light and strong as it can possibly be made. To this end all important parts subject to strain, are made of the best quality of steel forgings or castings and as little cast iron used as possible, in fact, at most the only cast iron parts used in the outfit are the engine cylinders and the grate bars. These are of cast iron because no other material will answer the purpose so well. The arrangement of the



Main Engines 8" x 8".

parts is such that the various movements are accomplished with directness and simplicity, and so that all the operations are under the control of one man. For facility in shipment the parts are sub-divided into convenient size and weights.

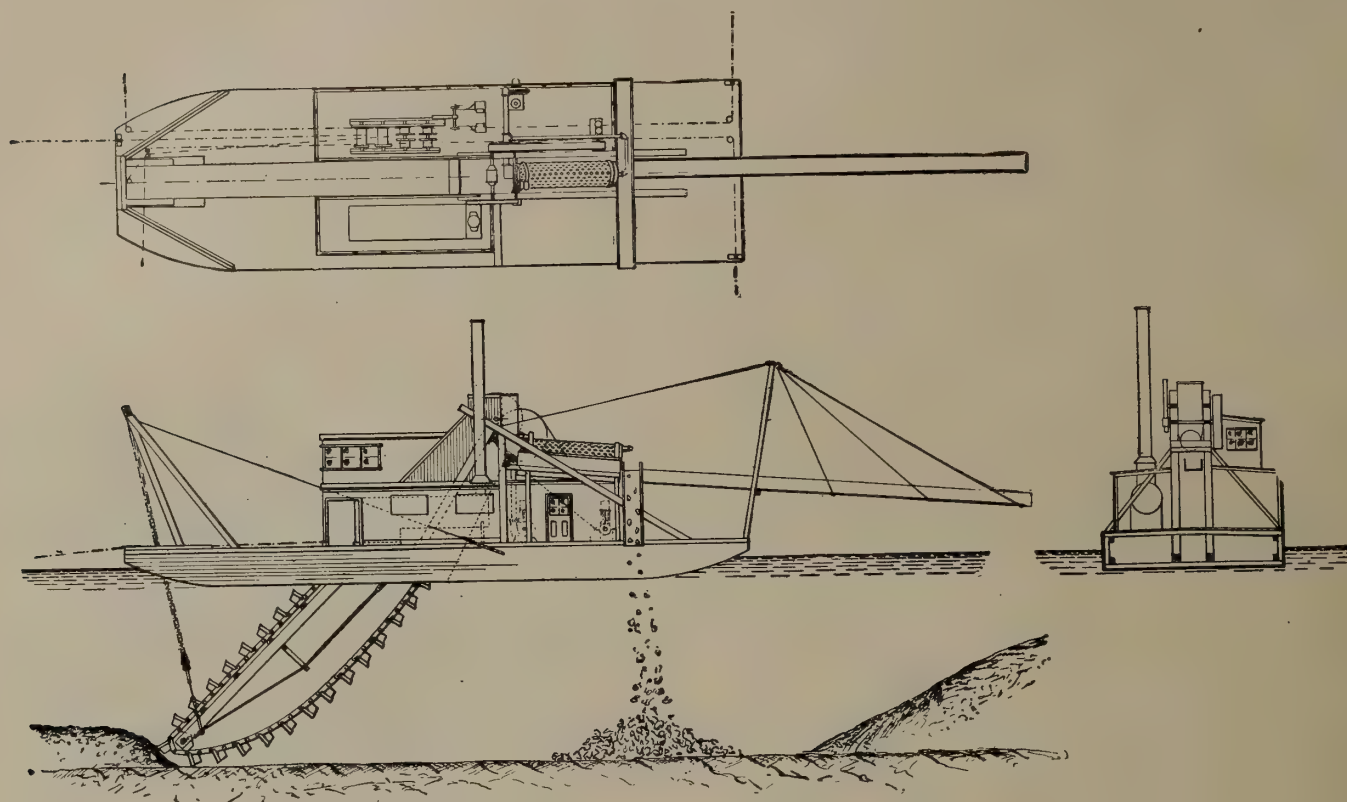
In carrying out the idea above outlined many radical departures from the usual construction were made, and a form of construction of the principal machinery was adopted after much consideration and study, which gives the greatest simplicity and the smallest number of parts that can possibly be used to accomplish the desired result.

The importance of simplicity and strength in a machine of this kind can only be appreciated by those who have had to struggle in a far off locality with a machine which was so complicated that it was difficult to keep it in order, and with certain parts so weak that they would break down. In a machine of this kind the presence of a single defective element is enough to nullify the advantage of all the rest which may be good.

The following is a brief description of the dredge:

The hull is of wood 85 feet long, 25 feet wide and 4 feet 6 inches deep, and is built of a form specially adapted to work in a rapid running river if required. The main framing is also of wood and consists of three main timbers on each side. These are connected in such a way as to hold the entire head machinery. The head frame timbers





Stewart River Gold Dredge—Side Elevation, Plan and Cross Section.



General View of Dredge, in operation on Stewart River, Yukon.



are connected by bracket castings of steel which also carry the ladder shaft so that no additional attachment is necessary for this purpose.

The dredge is fitted with a chain of buckets having a nominal capacity of  $2\frac{1}{4}$  cubic feet each. These buckets are entirely of forged steel, no steel castings are used in their construction. Cast steel bucket back are extensively used for elevator dredges, and the writer has also used them successfully for gold dredges, but where it is necessary to keep the weight down to the smallest possible limit a higher degree of strength can be secured and the liability to breakage through flaws in the steel casting obviated by making it of forged steel. The lip plates of the buckets are of the highest quality of machinery steel of such hardness that they will resist abrasion and at the same time will have



Screen and Casing.

the requisite toughness to resist breakage. The pins are of Hadfield's Patent Manganese Steel, and all the pin connections are bushed with renewable bushings of oil tempered tool steel.

The material from the buckets is delivered into the hopper and passed through a revolving screen. The coarse tailings are rejected and the fine material passes through the screen into the sluice box and is discharged astern. This dredge, therefore, is of the course screen and sluice box type, as distinguished from the New Zealand type, which possesses a fine screen and in which the gold is saved on tables. The writer prefers this type of dredge wherever it can be used on the score of simplicity and also because large capacity can be reached with a comparatively small screen, and the tailings can be discharged astern and distributed without the necessity of employing a tailings elevator. The only objection that can be urged against the sluice box type is that it is not capable of saving the very finest gold, or at least, will not save as large a percentage of it as the fine screen and table method. This is, therefore, a question of adaptability to the character of the ground and the gold to be saved, and in the particular locality where this dredge is to be used the gold is sufficiently coarse to be saved, in the sluice box. The action of the gold-saving part of the dredge is, therefore, precisely the same as in hydraulic mining, and as the tailings are discharged astern with a large quantity of water, they can be so distributed as not to interfere with the work of the dredge. In special cases where the ground to be worked stands at a considerable elevation above the water, it may be necessary to employ a tailings elevator, but the writer has used dredges of this type which excavated their way through dry ground standing 10 to 12 feet above water, and disposed of all the material without any tailings elevator. The movements of the dredge are controlled by wire ropes attached to anchorages, or on shore, and operated by an independent steam winch. This winch is placed on the main deck and consists of six drums driven by a pair of independent engines. In the design and construction of this winch the ideal of keeping the weight down to the smallest possible amount has been fully lived up to, and at the same time the strength and efficiency has not been sacrificed but rather improved. There is no cast iron in

this winch except the engine cylinders. The drums are of rolled steel plate with cast steel heads. The friction housings attached to each drum are of flanged steel plate with turned flanges. All the gears are of best cast steel and even the bearings in which the shafts are carried are steel castings of special and light design lined with babbit metal. The frame of the winch consists of two bars of flat steel to which all the bearings are bolted and which thus connects them all together and preserves the alignment and position of the gears. This bar frame is adapted to be down on top of timbers on the deck. Each drum is fitted with independent clutch and brake. The clutch operating levers are mounted on the winch and project up through the floor of the operating room above so that they can be directly reached and worked by the operator without any shafts, bearings, links or connections being necessary or attached to the boat in any way. This in turn greatly simplifies the erection of the dredge. It is only necessary to set the winch on deck and bolt it down, when it is ready for work as soon as the steam pipes are connected.

It may be incidentally mentioned that the time occupied in the construction and erection of this dredge was very brief considering the difficulties involved, and it is because of the simplicity of the design in little features such as these that the time of erection and completion was much less than ordinarily required.

The engines for driving the winch are of the vertical torpedo-boat type with a cast steel bed plate and forged and turned steel column frames. The engines are fitted with link motion and are of the highest quality of design and workmanship. They are so small and light that they can readily be picked up and carried by one or two men, and yet they are sufficiently strong that they can haul the entire dredge up a current of 9 or 10 miles per hour and can perform all the movements of the winch with ease.

With high class machinery of this kind built entirely of steel and of light weight, not only is the cost of transportation reduced, but the liability to breakage during handling and erection also. If these parts, such as the drums and flanges of the winch, had been made of cast iron as is ordinarily the case they might easily be broken through handling or falling on the ground or otherwise injured during the vicissitudes of their long journey. With these light steel parts, how-



6-drum Winch.

ever, no such risk is involved, and if by chance some parts should be injured or sprung out of shape through accident or a heavy blow it can be readily re-shaped and put back again.

The revolving screen is 38 inches in diameter by about 14 feet long. It is driven by steel gearing over the intermediate shaft of the head frame. A special method of driving this screen is employed which involves the use of very few parts and takes the power directly from the intermediate shaft. All the working parts are of steel and the screen is carried on four steel rollers. A special feature of this screen is that the perforated plates are built up on a steel frame in such a way that they can be readily replaced or renewed without taking down the frame or interfering with the driving mechanism. The holes in the screen are of large size being ordinarily calculated to permit about 80 per cent. of the material to pass through into the sluice box, only the larger stones being rejected. This practice is essentially different



from the New Zealand type in which the holes in the screen are comparatively small so that only the fine material passes over the tables. In the present case the screen with large holes allows the material to disappear quickly and, therefore, increases the capacity of the screen, and it also makes possible the disposition of the tailings without the use of the tailings' elevator, for the reason that only a small percentage of the material goes over the side, and which is not sufficient to obstruct the floating of the hull and the remainder is washed astern and distributed over a wide area by the combined action of the water and the movement of the boat.

The hopper into which the material is discharged by the buckets is also of steel and fitted with renewable lining plates.

The bucket ladder is of wood with steel fitting and truss rods.

The main engines are of the double high pressure torpedo-boat type having cylinders 8 x 8 inches. The entire engines are of steel except the cylinders, which are of cast iron. The power is transmitted to the tumbler by means of a belt 14 inches wide and provided with a tightener pulley.

The reverse levers and throttle valve of these engines are controlled from the pilot house so that the whole of the operation of the dredge is under control of one man.

Steam is furnished by one semi-portable return tubular boiler. It has a cylindrical shell 54 inches diameter by 14 feet long, and it has a very large fire box arranged under its entire length and adapted to burn inferior wood.

The water for sluicing purposes is supplied by one independent centrifugal pump having 10 inch suction and 8 inch discharge. In many of the New Zealand dredges the pump is driven from the main



Buckets  $2\frac{1}{4}$  cu. ft. capacity.

engines. The writer prefers to have it independent so that the water is under better control.

The hull is designed with ample space at after end so that gold-saving tables can be added at any future time if desired. The disposition of weight of the machinery upon the hull is such that it floats evenly and the draft of water does not exceed 3 feet.

The work of carrying out this enterprise as well as the erection and installation of the dredge on Stewart River was in charge of Mr. W. M. Ogilvie, and great credit is due to him for its accomplishment in so short a space of time in the face of many and great difficulties. The dredge was completed and put in service on the Stewart River just before the close of last season and could have worked a month if sufficient fuel could have been obtained. The parties, however, who contracted to furnish the fuel failed to fulfill their obligations, and as a consequence some time was lost. Sufficient was done, however, to demonstrate to Mr. Ogilvie's satisfaction that the dredge was a success and also that it was well adapted to work the ground under the conditions as they there exist. So many mistakes have been made and so many enterprises of this kind have ended in failure that the public is not yet prepared to believe that this dredge will prove an exception to the rule, but we have here a machine that is carefully designed and well-built, and that can perform its functions without continually breaking down, and I am sure that all the members of this Institute will unite in wishing Mr. Ogilvie the success he deserves when operations are renewed in the coming spring.



## MINING INSTITUTE

**Holds Largely Attended and Eminently Successful Meeting at Montreal—Many Valuable Papers Presented.**

The Annual General Meetings of the members of the Canadian Mining Institute were held as usual in the Club Room, Windsor Hotel, Montreal, on Wednesday, Thursday and Friday, 4th, 5th and 6th March. The following among others signed the register of attendance:—

- Thos. Cantley, Nova Scotia Steel and Coal Co., New Glasgow, N.S.
- Robert E. Chambers, N. S. Steel and Coal Co., Wabana, Newfoundland.
- B. A. C. Craig, Canada Corundum Co., Craignoun, Ont.
- Major R. G. Leckie, International Nickel Co., Sudbury, Ont.
- Captain J. Edwards Leckie, D.S.O., Torbrook Iron Mines, Torbrook, N.S.
- Joseph Errington, Massey Station Mining Co., Massey, Ont.
- Thomas W. Gibson, Director Bureau of Mines, Toronto.
- George E. Drummond, Canada Iron Furnace Co., Montreal.
- George R. Smith, M.L.A., Bell's Asbestos Co., Thetford Mines, Que.
- Harry J. Williams, N.E.—Canadian Asbestos Co., Thetford Mines, Que.
- James R. Pearson, Asbestos and Asbestic Co., Danville, Que.
- Charles Fergie, Intercolonial Coal Co., Westville, N.S.
- A. W. Robinson, C.E., Montreal.
- W. G. Miller, Provincial Mineralogist, Toronto, Ont.
- Dr. Robert Bell, Geological Survey, Ottawa.
- E. D. Ingall, A.R.S.M., Chief Division of Mines, Geol. Survey, Ottawa.
- A. P. Low, Geological Survey, Ottawa.
- Russell Blackburn, Blackburn Mica Mine, Ottawa.
- Prof. C. K. Leith, U.S. Geol. Survey, Madison, Wis.
- John E. Hardman, S.B., M.E., Montreal.
- Eugene Coste, E.M., Prov. Nat. Gas and Fuel Co., Toronto.
- Thomas J. Drummond, Londonderry Iron Co., Montreal.
- Prof. J. Bonsall Porter, McGill University, Montreal.
- C. P. Hill, New York.
- Fred. W. Hobart, Engineering and Mining Journal, New York.
- J. E. Sancier, Matane Copper Co., Matane, Que.
- J. Obalski, E.M., Inspector of Mines, Quebec.
- Jules Cote, Sec. Dept. Lands, Fisheries and Mines, Quebec.
- Dr. Frank D. Adams, McGill University, Montreal.
- Dr. W. L. Goodwin, Director School of Mining, Kingston.
- Dr. Eugene Haanel, Superintendent of Mines, Ottawa.
- Dr. T. L. Walker, Toronto University, Toronto.
- G. R. Mickle, M.E., School of Practical Science, Toronto.
- Harry Wilson, C. & M. E., Montreal.
- C. V. Corless, M.E., McGill University, Montreal.
- S. J. Simpson, James Cooper Manfg. Co., Montreal.
- E. W. Gilman, Canadian Rand Drill Co., Sherbrooke.
- J. M. Jenckes, Jenckes Machine Co., Sherbrooke.
- R. Auzias Turrene, Dawson, Y.T.
- Fritz Cirkel, M.E., Montreal.
- Alliene Case, E.M., British and Canadian Lead Co., Temiscamingue, Que.
- Dr. A. R. Ledoux, New York.
- J. C. Gwillim, Queen's University, Kingston.
- Prof. S. F. Kirkpatrick, School of Mining, Kingston.
- R. W. Brock, School of Mining, Kingston.
- R. P. Williams, Greenwood, B.C.
- H. W. Lawrence and J. S. Mitchell, Sherbrooke, Que.
- J. W. Evans, C.E., Deseronto, Ont.
- W. W. Leech, Geological Survey, Ottawa.
- J. A. Dresser, M.A., Richmond, Que.
- D. Forbes Angus, Intercolonial Coal Co., Montreal.



Dr. Alfred W. G. Wilson, McGill University, Montreal.  
 W. S. Dresser, Sherbrooke.  
 Joseph James, Actinolite, Ont.  
 O. N. Scott, Listowel, Ont.  
 Wentworth F. Wood, Kamloops, B.C.  
 H. C. Farnum, Detroit.  
 W. W. DeCourtenay and A. W. Stevenson, Montreal.  
 M. F. Connor, B. Sc., Ottawa.  
 Francis T. Peacock and Robert Musgrave, Montreal.  
 J. McLeish, Geological Survey, Ottawa.  
 J. M. Clark, K.C., Toronto, Ont.  
 A. S. Fraleck, Mining Engineer, Belleville, Ont.  
 H. W. Weller, Babcox & Wilcox Boiler Co., Montreal.  
 W. H. McDougall, White River, Ont.  
 B. T. A. Bell, Editor Canadian Mining Review.

## WEDNESDAY MORNING SESSION.

The members assembled at 11 a.m.

Mr. Charles Fergie, M.E., the President in the Chair.

The Minutes of the last Annual Meeting and the Report of Council for the year having been printed and distributed among the members were taken and read.

## TREASURER'S REPORT.

Mr. J. STEVENSON BROWN presented his financial statement for the year showing: Receipts \$7,338.29; Disbursements \$5,655.80; Balance in hand \$1,682.49. The disbursements showed expenditures on account of publications \$2,756.37; Library \$655.01; Meetings \$655.90; Legislation and Deputations \$165.40; Secretary's office \$919.25; Treasurer's office \$493.86.

The report was adopted.

## NEW MEMBERS.

The following new members were elected:

W. H. Johns, Elizabeth Mine, Port Arthur.  
 J. Errington, Massey Station Mining Co., Massey, Ont.  
 W. E. H. Carter, M.E., Bureau of Mines, Toronto.  
 Wentworth F. Wood, Kamloops, B.C.  
 O. N. Frechette, Montreal.  
 Hugh Macpherson, Ontario Powder Works, Kingston.  
 Daniel O'Connor, Mine Owner, Sudbury.  
 Alliene Case, M.E., British and Can. Lead Co., Ville Marie, Que.  
 Frank Cochrane, Sudbury, Ont.  
 Charles M. Donohoe, Boston—Richardson Mining Co., Goldboro, N.S.  
 Col. J. Boardman Cann, Mabou Coal Mining Co., Mabou, N.S.  
 E. L. Fraleck, Mining Engineer, Belleville, Ont.

## SCRUTINEERS APPOINTED.

On motion, Messrs. R. E. Chambers, Frederick Hobart and H. W. DeCourtenay were elected Scrutineers.

## AUDITORS RE-ELECTED.

On motion, Messrs. H. W. DeCourtenay and George Macdougall were re-elected Auditors.

The meeting adjourned at twelve o'clock.

## WEDNESDAY AFTERNOON.

The members met at three o'clock, the President in the Chair.

## PRESIDENTS' ADDRESS.

Mr. CHARLES FERGIE who, in rising, was greeted with applause, said:—

It is most satisfactory to find our Council report the Institute in such a flourishing condition both financially and as regards membership, the members for 1902 being 453, shewing a gain of 70 over that of the previous year. The steady increase in membership, embracing as it does the best mining men of Canada and the United States, I think is the best criterion of the Institutes' worth as a Society for the discussion of the science and practice of Mining and other kindred subjects. The papers published during the past year were of a high order, and will, I think, rank with those of other societies of its years and membership; no less than one hundred papers were presented during the year. The affiliation of the students of McGill and Queen's with this Institute I consider of great importance. By being associated with us they have all the benefits of the Society in the way of receiving the publications, attending meetings, and listening to and taking part in the discussions, and thereby profiting by the experience of the older members; they also have opportunity to write papers for the students' competition, and thereby educate and prepare themselves for work of im-

portance they may expect to be called to do in the near future. I would strongly impress upon these students the great necessity and benefit to be derived from writing and expressing their thoughts in the form of a paper; it teaches them to think carefully for themselves, to express themselves clearly and concisely, gives confidence in themselves, and as I said before, is preparing them for the important work they expect to take up later as a profession. That this organization is of great benefit to the mining fraternity I think will not be denied, both as a medium for protection against pernicious legislation and for the interchange of knowledge and ideas in the ordinary everyday practice of the mining and metallurgical engineer.

## PROSPERITY OF COAL MINING IN CANADA.

The year 1902 has been one of unbounded prosperity for Canada, and it is most gratifying to believe that the present one will be equally so. The production of coal in the Dominion during 1902, was approximately:—

|                                    |                |
|------------------------------------|----------------|
| Nova Scotia—                       |                |
| Cape Breton.....                   | 3,470,449      |
| Inverness.....                     | 120,587        |
| Victoria.....                      | 12,037         |
| Total Cape Breton Island.....      | 3,603,073      |
| Pictou County.....                 | 567,237        |
| Cumberland County.....             | 555,170        |
| Total for Mainland Collieries..... | 1,122,407      |
| Total for Nova Scotia.....         | 4,725,480 tons |
| New Brunswick.....                 | 10,000 "       |
| Assiniboia.....                    | 69,000 "       |
| Alberta.....                       | 346,654 "      |
| British Columbia.....              | 1,750,000 "    |
| Yukon.....                         | 2,000 "        |
| Total.....                         | 6,903,134 "    |

## COAL TRADE.

|                                                |             |             |
|------------------------------------------------|-------------|-------------|
| Bituminous mined in Canada.....                | 6,903,134   | “           |
| Bituminous imported (round and slack).....     | 3,806,129   | “           |
|                                                | <hr/>       |             |
| Total Bituminous.....                          | 10,709,263  | “           |
| Less exported—                                 |             |             |
| Great Britain.....                             | 19,986 tons |             |
| United States.....                             | 1,854,753   | “           |
| Newfoundland.....                              | 123,738     | “           |
| Other.....                                     | 91,791      | “           |
|                                                | <hr/>       |             |
|                                                | 2,090,268   | tons        |
|                                                | <hr/>       |             |
| Add Anthracite Coal imported.....              | 8,618,995   | “           |
|                                                | 951,883     | “           |
|                                                | <hr/>       |             |
| Total coal consumption of Canada.....          | 9,570,878   | “           |
| as compared with 9,334,725 tons in 1901.       |             |             |
| A comparison of the bituminous exports shows:— |             |             |
|                                                | 1901        | 1902        |
| Great Britain.....                             | 29,909 tons | 19,986 tons |
| U. S. A.....                                   | 1,395,142   | “           |
| Newfoundland.....                              | 83,153      | “           |
| Other.....                                     | 65,457      | “           |
|                                                | <hr/>       | <hr/>       |
|                                                | 1,573,661   | “           |
|                                                |             | 2,090,268   |
|                                                |             | “           |

Having touched generally on the coal mining operations of Canada I shall now confine myself more particularly to the progress of

## COAL MINING IN NOVA SCOTIA.

The coal field of Nova Scotia is divided into three distinct districts, viz.: Cape Breton Island, Pictou and Cumberland. The Cape Breton mines are within easy reach of the surface; the pitch of the seams is, generally speaking, very slight; they are comparatively free from fire-damp, little broken up by faulting, and altogether present the most favourable conditions for large outputs and low cost of production. Referring back ten years ago (1892) the total coal production of the Island of Cape Breton was less than one million tons. Last year (1902) the total production exceeded three and a half million tons, and of this quantity one Company—the Dominion Coal Company—are to be credited with three million tons. A gain of two and a half million tons in ten years is certainly not a bad shewing, but the next decade I predict will greatly eclipse these figures. With the exception of Old Mines, Sydney, and where safety lamps are used and blasting explosives prohibited, the mines are worked with open lights and black powder used for blasting coal; the mode of working is bord and pillar, coal cutting machines are rapidly displacing hand pick mining, the Dominion Coal Company producing no less than 76 per cent. of its total output by machines and the Nova Scotia Steel and Coal Company 33 per cent. and which will shortly be increased to 50 per cent.



## CONDITIONS AT THE MAINLAND COLLIERIES.

In Pictou and Cumberland a different condition of affairs exists; the seams pitch at a considerable angle, anywhere from 16° to 40°; the seams give off considerable fire-damp, and with the exception of one or two small surface winnings, all the mines are worked with locked safety lamps, and where blasting is permitted none but the so-called flameless explosives are used. The mode of working is both by bord and pillar and longwall, the latter being altogether adopted in the deeper seams of Pictou County. The total output of the Mainland Mines in 1892 was 903,979 tons, that of 1902 being 1,122,407 tons. The present year promises to show large increase of output for all the mainland collieries.

Pictou is famous for its thick seams of coal, the well known Foord Pit Seam showing a section of 34'7" of coal; and at the Albion Mines five seams show an aggregate thickness of 84 feet of coal. Cumberland County field has of late years proved to be much more extensive and important than geologists formerly gave it credit, and faults which were thought to exist and cut off a certain portion of the field have not materialized; large tracts of good coal have been found instead. At the Joggins, Bay of Fundy, there is a fine exposure of the measures, amounting to more than 14,000 feet, extending from the marine limestones of the lower Carboniferous to the top of the coal formation. The beds that appear at the Joggins can be traced northeastward for many miles. The total production for the County in 1892 was 456,229 tons, and that for 1902 was 555,170 tons.

## PROSPERITY OF NOVA SCOTIA COAL MINING.

In round numbers the Nova Scotia mines produced during the past year 4,725,480 tons, found direct employment for 8 500 men and boys, of whom 2,500 were employed above ground and 6,000 below ground. Nineteen lives were lost in the production of that quantity of coal, or one life for about every 248,709 tons of coal produced. During the past year no gas explosion or serious accident has to be reported, and the loss of life occurring resulted from small and peculiar accidents, incident to all coal mines.

*Comparative Table Shewing Tons of Coal Produced and Number of Lives Lost:*

| COUNTRY.             | Tons (2240) lbs. of Coal Produced. | No of Persons Employ'd | No. of Live- Lost. | Lives lost per 1000 Persons Employ'd | Tons Coal produced per life lost. | Tons Coal produced per annum per person employed. |
|----------------------|------------------------------------|------------------------|--------------------|--------------------------------------|-----------------------------------|---------------------------------------------------|
| United Kingdom*      | 220,000,000                        | 493,133                | 1,018              | 2.06                                 | 216,110                           | 446                                               |
| United States† . . . | 261,000,000                        | 433,331                | 1,508              | 3.48                                 | 173,077                           | 603                                               |
| Nova Scotia‡ . . . . | 4,725,480                          | 8,500                  | 19                 | 2.23                                 | 248,709                           | 556                                               |

\*Assumed output for 1902, correct figures not at hand

†Return for 1901 by U. S. Geological Survey.

‡Actual production, 1902.

## UP-TO-DATE EQUIPMENTS THE RULE.

Comparing the mines and equipment in Nova Scotia of to-day with those of ten years ago, one sees great improvements. Mines then producing 600 to 700 tons were looked upon as satisfactory whilst to-day 1,000 tons output is only considered moderate, and at the largest pits two thousand and up to 2,700 tons are the rule; formerly old fashioned boilers carrying forty to sixty pounds pressure were the rule; now we have the latest and most approved time of water tube boilers working at from 100 to 150 lbs. pressure; large and improved up-to-date hoisting engines and large capacity ventilating fans; improved screening and picking plants; the best air compressing and electric plants are now the rule; also extensive shipping piers capable of accommodating the largest colliers, and where despatch is given second to none in the world. New and extensive mines are now being opened up and the outlook for Nova Scotia is bright and promising; its mineral wealth is great, and it is, therefore bound to become a great province.

## IRON AND STEEL INDUSTRIES.

Not only in coal is Nova Scotia making a name for itself, but we have the large and important iron and steel works of the Dominion Steel Company, Ltd., and the Nova Scotia Steel & Coal Company Ltd., both turning out a product second to none in the world, and which is finding a ready market in Canada, the United States and Europe, and which it is claimed can compete with any similar product in the world. The amount of pig iron produced during the past year was 214,293 short tons; steel of all kinds 104 331 short tons.

## GOLD MINING IN NOVA SCOTIA.

Then again we have the gold mines which produced 28,279 ounces of gold. There are now in process of construction throughout the various dis-

tricts a number of large and modern plants, both for milling and mining on a large scale and to much greater depths than at present, and a considerable increase of production is looked forward to in the near future.

## MACHINE MINING IN NOVA SCOTIA.

Taking the Coal Mines of Nova Scotia as a whole they compare favourably with the mines of the United States and Europe. Of course our mines are only in their infancy compared with either of the two mentioned countries, but I venture to predict that during the next ten years that as regards equipment and large outputs from individual mines, we shall not only hold our own but take the lead. To do this it behoves mine managers to be ever on the alert, fix their standard at a high plane, be ever watchful to make improvements and keep abreast of the times. Should they find themselves handicapped with obsolete plant and machinery, it should be relegated to the scrap heap; the question is not how much improved plant will cost, but what can be saved by making the change. We require in working coal mines to obtain the largest possible tonnage per man employed, and to do this and compete profitably with the rest of the world, Coal Cutting Machines must be employed, in every possible instance. Nova Scotia has started out in a very fair way to do this, for out of 4,725,480 tons of coal produced last year, no less than 2,300,000 tons or 49% was machine mined. This is a fair showing when we note that the United States is cutting 25% of its coal by machines, while Britain does not exceed 2%.

## ELECTRICITY VERSUS COMPRESSED AIR.

Advance in science has done much in the past and will do still more towards the future successful operation of coal mines. Electricity for underground haulage, pumping, etc., is now better understood, and in the future must play an important part both underground and on the surface, and prove an indispensable adjunct to economy and efficiency; but in gassy mines I am inclined to think that compressed air will hold its own for some time to come, and it is a question if the up-to-date stage compressors with intercoolers and working at high pressures are far behind electricity in point of economy, taking everything into account, and it is not likely they will ever be displaced altogether, as it is an absolutely safe motive power, easy to handle, and so far as coal cutting machines are concerned generally, is at the present time superior to electricity. On the surface where there are a number of scattered engines around the bankhead, workshops and saw-mills, etc., there is no question that electricity is the power to adopt to ensure economy.

## COAL DUST EXPLOSIONS.

Much has been learned in late years regarding coal dust as a factor in mine explosions, and to-day it is even more dreaded than fire-damp, seeing that a very small percentage of the latter in a dusty mine is capable in case of fire of propagating the most serious of explosions, and which will carry devastation from one extreme of the workings to the other. The only safe remedy for such mines is systematic watering of the roadways and the periodical removal of accumulation of dust, and this is a matter Mine Managers who have dusty mines and little gas to contend with will do well to bear in mind. While speaking of gassy and dusty mines it is my opinion that open lights and blasting with loose black powder should be strictly prohibited by law, and that the most improved safety lamps and some of the so-called safety explosives substituted; otherwise there can, though it may be long in arriving, be only one result—explosion and loss of life.

## THE ANTHRACITE STRIKE.

The past year has witnessed one of the most severe and stubborn strikes in the history of coal mining in the United States. That disputes between Capital and Labor should have to be decided by such brutal methods is a reflection on this enlightened age. That the settlement of all labor disputes in future will be decided by arbitration or some other common sense method is the wish of all right thinking employers and employees. That labor organizations are lawful and have come to stay, may as well be recognized first as last; at the same time while unions have the right of organization they must be responsible in the eyes of the law and understand that in a free country a workman shall sell his labor as he pleases, and that without intimidation or coercion.

## OUR HOME MARKET INDISPENSABLE.

Whilst the strike in the United States created an increased market for Nova Scotia coal, and also gave it an impetus in our own market, not nearly so much coal was shipped over the border as many imagined would be the case; the home market being so good and the imports of anthracite having fallen off most considerably, the mines had all they could do without seeking foreign markets. Another result of the strike has been the



removal of the duty for one year on all coal entering the United States. That this is simply a temporary expedient to relieve the situation, and also has some political significance will not be denied, and there is no guarantee that at the end of the year it will be continued. No sooner was this action taken on the part of the United States, than many of our Ontario friends became excited and cried out that the Dominion should likewise remove the duty on bituminous coal—there being no duty on either hard coal or coke entering Canada. Fortunately for the coal operators there are those governing at Ottawa who understand the coal situation, and have some idea of what the removal of the duty on coal would mean to the Nova Scotia mines, and it is not at all likely they will be influenced by the temporary removal of the United States duty. We have built up a good home market, a market steadily increasing, and we do not propose to hand it over to our neighbours. If the duty on Canadian coal were removed to-morrow it is not at all sure that Ontario would get her coal at any less cost than under existing affairs; that they receive no benefit or got it cheaper by the removal of the duty on anthracite is well understood by those in business.

In conclusion, I beg to thank the Council, Secretary and Treasurer for their very able assistance rendered me during the past year of my Presidency. (Applause.)

Major LECKIE—I would like to say a word, and that is I have much pleasure in congratulating the Institute upon the report of the council, showing that under your very able presidency, and with the aid of the secretary, whose services you have referred to, the Institute has made very great progress. In 1898 the membership was 192, and in 1902 it was much more than double that—453—and beyond question we are indebted to the untiring work of our secretary, Mr. Bell, for the very able way in which the Institute has been managed. Referring to your address, Mr. President, I may say that I know very well the conditions of the coal mining industry of Nova Scotia, and I have pleasure in saying that a great deal of the improvement in mining methods and mining plant is due to the initiation and example of the president of this Institute. When he came to Nova Scotia, he took hold of one of the most fiery and dangerous mines in the whole province. He has managed it not only successfully with great engineering ability, but also financially, and I think he occupies the strongest position in both respects of any man I know of in the coal trade of Canada. As to unions, we have no need to discuss these matters; but I might say that our president has been exceedingly successful in dealing with his men and avoiding strikes and strife, and that also is a very important feature of successful management. The principle which I always followed is the same as Mr. Fergie has spoken of. The unions have come to stay, and must be recognized; but the way to avoid strikes and trouble is to always urge the very best workmen to attend the union meetings, and not leave it to the shiftless and idle, who are very unsteady, but "have the gift of the gab," and do all the talking at these meetings. We know very well that when the best men control matters there will be very little trouble.

There is one thing I should like to say, and that is we had in Toronto lately what was claimed to be a mining convention, but it was a fraud. The people in Toronto know very little about our Institute, and I have urged our secretary more than once to hold one of our meetings at least in Toronto. I do not remember that we have had a single meeting there since the Institute was organized. It is due to the people of Ontario that we should have a meeting in Toronto, and I am sure that it would be well attended and quite as successful as any which we have recorded in our history here. Taking the Ottawa River as the division, there are nearly double the members west of the Ottawa that there are from the east, and therefore I think that the claims of Toronto have been very unfairly ignored. I suggest that we have the next meeting there.

The SECRETARY—With regard to Major Leckie's remarks I may say that we intend to hold a meeting in Ontario this year, as the report of the council shows. We should have had one at Sault Ste. Marie last year, but the members of the Lake Superior Mining Institute, whom we had invited as our guests, could not come. The difficulty of a Toronto meeting has been first, that there has been no really suitable hotel accommodation and our meetings have been held outside, either in the Parliament Building or at the School of Practical Science. Much of the success of the meetings here has been due to the fact that the members have been staying in the hotel, and we get them together very easily. We have been meeting here in this Club Room since 1889, under different organizations, and we have found it most convenient. Our meetings have always been successful, and I think we have been rather chary of taking chances of meeting any where else at this time of year.

Professor PORTER—There is one point in the president's address upon which I should like information: Has he ever worked out the number of deaths per ton of coal produced?

The PRESIDENT—I have the coal produced for life lost. I am taking the year 1901, as I could not get the figures for last year. The coal produced per life lost was: Great Britain, 216,000 tons; United States, 194,000, and Nova Scotia, 240,000. In this respect, therefore, Nova Scotia takes the lead. When, however, it comes to the coal produced per person employed, the United States takes the lead, and that is due to the large amount of machinery that is in operation there.

Dr. GOODWIN—Might I also ask a question? It has been said that the strike in the anthracite region leading to the use of bituminous coal in Canada, instead of anthracite, will lead to the permanent replacement of a portion of the anthracite. Have you been able to see any signs of it in your exports?

The PRESIDENT—I have very slightly myself; nothing like the extent that is claimed.

#### PRESENTATION OF PRESIDENT'S MEDAL.

Mr. O. N. Scott, of Listowel, Ont., who won the president's medal in the students' competition with his paper on "The Ore Deposits of Copper Mountain, Similkameen District, B.C." was then called forward, and in handing the medal to him, President Fergie expressed the hope that it would be the incentive to still further hard work on Mr. Scott's part. The two cash prizes of \$25 each had, the president said, been awarded to Mr. H. W. DePencier, of McGill, for his paper describing "Mine Timbering in the Old Ironsides and Knob Hill Mines," and to Mr. L. P. Silver, of Queen's, for his review of "The Sulphide Ore Bodies of the Sudbury Region."

#### THE PRODUCTION AND EXPORT OF CANADIAN MINERALS AND METALS.

Mr. B. T. A. BELL.—During the past two years I have endeavoured to present to this meeting such authentic figures as were available, showing the production and movement of Canadian minerals and metals during the year. I have here, open for the inspection of members, an immense amount of data, covering the year 1902. These figures show, notwithstanding a considerable falling off in the production of gold in the Yukon, and a shrinkage in value of over two millions of dollars in the mineral and metal production of British Columbia that the total value for the whole Dominion may be conservatively stated at \$71,627,528, as compared with \$70,122,525 in 1901. By provinces these returns show:—

| Nova Scotia:                                                                                                 |                                                                                                  | 1902                                                                                    | 1901         |
|--------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------|
| Coal.....                                                                                                    | 4,725,480 tons.....                                                                              |                                                                                         |              |
| Coke.....                                                                                                    | 382,989 ".....                                                                                   |                                                                                         |              |
| Pig Iron.....                                                                                                | 214,293 ".....                                                                                   |                                                                                         |              |
| Steel.....                                                                                                   | 104,331 ".....                                                                                   |                                                                                         |              |
| Gold, Gypsum, Manganese, Grindstones, Baryest, Tripoli, Copper Ore and Building Materials.....               |                                                                                                  | \$19,501,131                                                                            | \$13,000,000 |
|                                                                                                              |                                                                                                  | (In this estimate due regard has been made for Coal, (Coke, and Pig Iron re-converted.) |              |
| British Columbia:                                                                                            |                                                                                                  |                                                                                         |              |
| Gold.....                                                                                                    | \$5,500,000.....                                                                                 |                                                                                         |              |
| Silver.....                                                                                                  | 4,000,000 ounces.....                                                                            |                                                                                         |              |
| Copper.....                                                                                                  | 30,000,000 lbs.....                                                                              |                                                                                         |              |
| Lead.....                                                                                                    | 23,000,000 lbs.....                                                                              | \$18,433,004                                                                            | \$20,713,000 |
| Coal.....                                                                                                    | 1,750,000 tons.....                                                                              |                                                                                         |              |
| Coke.....                                                                                                    | 128,000 tons.....                                                                                |                                                                                         |              |
| Zinc, Platinum, Iron Ore, Building Materials.....                                                            |                                                                                                  |                                                                                         |              |
| Yukon:                                                                                                       |                                                                                                  |                                                                                         |              |
| Gold.....                                                                                                    | \$12,500,000 (returns given by Canadian Bank of Commerce Coal 2,000 tons, Silver, Platinum.....) | \$12,600,000                                                                            | \$18,500,000 |
| Ontario:                                                                                                     |                                                                                                  |                                                                                         |              |
| Copper.....                                                                                                  | \$686,043.....                                                                                   |                                                                                         |              |
| Gold.....                                                                                                    | 229,828.....                                                                                     |                                                                                         |              |
| Iron Ore.....                                                                                                | 518,445.....                                                                                     |                                                                                         |              |
| Molybdenite.....                                                                                             | 400.....                                                                                         |                                                                                         |              |
| Nickel.....                                                                                                  | 2,210,961.....                                                                                   |                                                                                         |              |
| Pig Iron.....                                                                                                | 1,683,051.....                                                                                   | \$13,577,440                                                                            | \$11,422,525 |
| Silver.....                                                                                                  | 80,000.....                                                                                      |                                                                                         |              |
| Steel.....                                                                                                   | 1,610,031.....                                                                                   |                                                                                         |              |
| Zinc.....                                                                                                    | 11,500.....                                                                                      |                                                                                         |              |
| Non-metallic.....                                                                                            | 7,292,181.....                                                                                   |                                                                                         |              |
| Quebec:                                                                                                      |                                                                                                  |                                                                                         |              |
| Asbestos and Asbestic.....                                                                                   | \$1,500,000.....                                                                                 |                                                                                         |              |
| Copper Pyrites, Chrome, Mica, Phosphate, Ferro Chrome, Iron Ore, Pig Iron, Steel and Building Materials..... |                                                                                                  | \$4,000,000                                                                             | \$3,500,000  |
| North-West Territories and Manitoba:                                                                         |                                                                                                  |                                                                                         |              |
| Coal—Lethbridge.....                                                                                         | 153,704 tons.....                                                                                |                                                                                         |              |
| Blairmore.....                                                                                               | 75,000 ".....                                                                                    |                                                                                         |              |
| Anthracite.....                                                                                              | 16,550 ".....                                                                                    |                                                                                         |              |
| Canmore.....                                                                                                 | 91,400 ".....                                                                                    | \$2,515,953                                                                             | \$1,700,000  |
| Souris.....                                                                                                  | 64,000 ".....                                                                                    |                                                                                         |              |
| Gold, Gypsum, Building Materials.....                                                                        |                                                                                                  |                                                                                         |              |



## New Brunswick:

|                                                               |              |              |
|---------------------------------------------------------------|--------------|--------------|
| Gypsum, Copper, Manganese, Coal and Structural Materials..... | \$1,000,000  | \$1,000,000  |
| Total mineral production of Canada..                          | \$71,627,528 | \$70,122,525 |

The following returns have been compiled from the monthly Blue Books issued by the Department of Customs, and show the exports during the calendar year.

|                                     |       |            |              |
|-------------------------------------|-------|------------|--------------|
| Antimony Ore.....                   | Tons  | 90         | \$13,658     |
| Arsenic.....                        | Lbs   | 547,698    | 16,192       |
| Asbestos.....                       | Tons  | 31,074     | 994,981      |
| Barytes.....                        | Cwt   | 2,500      | 700          |
| Chromite.....                       | Tons  | 740        | 7,535        |
| Coke.....                           | "     | 60,568     | 180,915      |
| Coal.....                           | "     | 2,092,268  | 5,402,235    |
| Copper.....                         | Lbs   | 26,124,418 | 2,476,511    |
| Felspar.....                        | Tons  | 7,374      | 13,699       |
| Gold.....                           | "     | 16,921,861 | 16,921,861   |
| Gypsum (crude).....                 | Tons  | 289,600    | 295,215      |
| Iron—Ore.....                       | "     | 428,901    | 1,065,019    |
| " Pig.....                          | "     | 82,587     | 882,795      |
| " and Steel—manufactures of.....    | "     |            | 2,007,784    |
| Lead.....                           | Lbs   | 17,761,484 | 457,170      |
| Manganese Ore.....                  | Tons  | 162        | 4,062        |
| Mica.....                           | Lbs   | 1,650,902  | 381,812      |
| Mineral Pigments.....               | "     | 703,297    | 6,182        |
| Mineral Water.....                  | Galls | 8,349      | 2,787        |
| Nickel.....                         | Lbs   | 14,350,721 | 1,007,211    |
| Oil, crude and refined.....         | Galls | 1,026      | 186          |
| Ores—all other N. E. S.....         | Tons  | 2,582      | 78,854       |
| Phosphate.....                      | "     | 70         | 1,880        |
| Platinum.....                       | Ozs   | 7          | 116          |
| Plumbago.....                       | Cwt   | 17,725     | 23,094       |
| Pyrites.....                        | Tons  | 18,584     | 50,178       |
| Salt.....                           | "     |            | 3,798        |
| Sand and Gravel.....                | Tons  | 159,683    | 118,894      |
| Silver.....                         | Ozs   | 3,422,390  | 1,823,058    |
| Stone—building, freestone, etc..... | Tons  | 263,843    | 121,440      |
| " ornamental and granite.....       | "     | 676        | 3,389        |
| " grindstones, rough.....           | "     | 1,458      | 11,223       |
| Other articles of the mine.....     | "     |            | 282,735      |
| Grand total.....                    |       |            | \$34,667,169 |

The following figures compiled from the Trade and Navigation returns show the imports of our principal minerals and metals together, with one or two items, likely to be of interest to members of this Institute.

The figures are for the fiscal year ended 30 June, 1902.

|                                       |          |            |              |
|---------------------------------------|----------|------------|--------------|
| Coke.....                             | Tons     | 266,140    | \$953,028    |
| Coal and coal dust, Anthracite.....   | "        | 951,883    | 4,239,693    |
| " Bituminous.....                     | "        | 3,300,199  | 6,509,071    |
| " " slack.....                        | "        | 505,930    | 267,344      |
| Copper, and manufactures of.....      | "        |            | 1,557,141    |
| Iron Ore.....                         | Cwt      | 10,646,534 | 939,454      |
| " Pig.....                            | Tons     | 75,134     | 1,105,972    |
| * Iron and Steel, manufacture of..... | Dutiable |            | 24,482,366   |
| * " " ".....                          | Free     |            | 7,771,588    |
| Mining and Smelting Machinery.....    | "        |            | 871,517      |
| Wire rope, rigging, etc.....          | "        |            | 167,307      |
| Lead, and manufactures of.....        | "        |            | 874,769      |
| Grand total.....                      |          |            | \$49,739,250 |

I am aware that these figures do not correspond with the returns issued by the Geological Survey, but, nevertheless, I am quite confident they will stand the most careful examination, and that they will be found to be an exceedingly conservative estimate of the value of the business done by our mines and metallurgical works during the past year.

The PRESIDENT—I think we are very much indebted to Mr. Bell for the time and care he has taken to give us these figures; whatever differences of opinion there may be as to values, figures published twelve months after the close of the year cannot be of equal value to their issue within a month or two.

Mr. E. D. INGALL—Chief of the Division of Mining Statistics handed to the President a copy of the Advance Sheet issued by the Geological Survey, estimating the production of minerals in Canada during 1902 as \$64,970,732 as against \$66,970,732 in 1901.

The PRESIDENT—In view of Mr. Ingall's summary, I of course withhold my statement. At the same time it does not in any way detract from the figures which Mr. Bell has presented. There are doubtless differences in computing values.

Mr. BELL—I regret very much that Mr. Ingall has not given us an opportunity to examine the figures given in his summary. As stated I am prepared to justify the figures I have given, for the returns have been furnished to me direct from the mines, from railway and navigation returns, and from reports by the directors of our Provincial Bureaus of Mines. I see no reason whatever for altering my estimate of \$71,000,000 as the value of our production in 1902. Mr. Ingall's figures of the produc-

tion from the Yukon do not agree with the figures reported to me by the General Manager of the Canadian Bank of Commerce, and in my judgment his estimate of the value of our nickel output is altogether too high. The discrepancy between the figures quoted by the Geological Survey for this product and those given by the Ontario Bureau of Mines is most marked. The valuation of our nickel matte should not be quoted, as the Survey states it, at the New York market quotations for refined nickel, but as the value of the matte at Sudbury. In the Annual Report of the Survey for the year 1901, issued a week or two ago, it is stated that the total value of the mineral and metal production of Nova Scotia in that year was something like \$8,000,000. These figures are too low and give the public an altogether wrong impression of the relative value of the mining industries in Nova Scotia compared with the production from the other provinces; moreover, I venture to say that the value of the coal output of Nova Scotia in that year, based on the selling price of coal in 1901 at the pits mouth alone exceeded the value of the figures which Mr. Ingall has given as the total production of the Province. There is an urgent necessity for better and more prompt publication of our mineral statistics and for greater uniformity in computing values. We have at Ottawa statistics published annually by Mr. Johnson, the Dominion Statistician, we have the annual reports of the Survey, we have monthly statements of exports and imports published by the Departments of Customs and Trade and Commerce, and, in addition to these, reports and bulletins issued periodically by the Mining Departments of the different Provinces. None of them agree, and in the interest of the industries which this Institute represents I take it to be our duty to call attention to these discrepancies.

Mr. E. D. INGALL—As far as I can see the two statements practically agree. There is a certain difference of opinion as to the value to be put upon things. In Yukon gold, Mr. Bell says \$12,500,000; we say \$14,000,000. We had the former figures from one source and the latter from another. Looking at the whole matter, the figures are about as accurate as you could get them. The mint is the purchaser of the Yukon gold, and its figures have been adopted. We have got the value higher than Mr. Bell, who seems to think that we estimate things too low all the time. To go into a comparison of figures like these, one should have them printed and set side by side, and wherever discrepancies occur, they should be carefully looked into, and if they are actual discrepancies, and not merely differences in price and valuation, it is then time enough to cry out that there is something the matter with them. In valuing any product, it is open to a difference of opinion as to what point you should value it at; you only value large quantities at average figures. I must compliment Mr. Bell on his industry in getting together a mass of figures like these, but I really don't see that there is anything before the meeting which can be very well discussed, unless specific points are taken up.

The PRESIDENT—What did you put down for coke, Mr. Ingall?

Mr. INGALL—\$3.50. I might point out that we have not included in our general statement any pig iron produced from foreign ores, we have simply taken what was produced from Canadian minerals. Nearly all the items in our summary are made up from the direct returns from the producers themselves. When a producer says that he has made so much mineral, and that it is worth so much, you take his figures.

Mr. HOBART—The only reasonable or correct standard is the value of the metals in the ore or matte, or whatever form they are in at their final value. A standard is the main point; you must have a standard, and stick to it, or your statistics will be of no value.

The SECRETARY—I quite agree with you, but I say that the standard is incorrect. What is the standard value of nickel, or copper-nickel matte produced at the works at Sudbury?

Mr. HOBART—I should put the value of it at the value of the metals contained.

The SECRETARY—At Sudbury.

Mr. HOBART—In the final form.

The SECRETARY—You cannot get final value until the matte has been refined at New Jersey.

Mr. GIBSON—The matter of statistics has come up at previous discussions at this Institute, and no doubt it is an important point. Statistics are practically to an industry what the barometer is with regard to the weather, or the patient's pulse with regard to his condition. They show whether an industry is prospering or the reverse. Statistics in order to be useful, must not only be published with reasonable promptitude after the expiration of the period to which they refer, but they must also be as nearly correct as they can be made. If there is any comparison of values between these two qualities, I would lay greater stress upon accuracy than promptitude of



publication. I think that the Geological Survey has for the last few years published its statistics with unusual promptitude after the close of the year. Its preliminary statement has been brought out a couple of months after the end of the year, and its final statement, in which much greater detail is given, usually comes out a year or a little more after the period for which it is issued.

With regard to Mr. Bell's statistics, and also with regard to Mr. Ingall's, as published in his preliminary report, if I wanted to criticise, I think I could point out some ways in which both are imperfect. For instance, Mr. Bell has included the value of all the iron ore produced in Canada, and he gives us the value of all the pig iron produced in Canada, and he gives us the value of all the pig iron produced very largely from that same ore. He also includes the steel which is produced from the pig iron produced from the iron ore; so that we have in this case the values duplicated at least twice. Again, we have the value of the coal given, and the value of the coke produced from the same coal. After all, it matters little what basis you adopt for the valuation of statistics, as long as it is understood; but if we wish to get an absolutely correct value of the mineral production of our country or province, I don't think it is right to include the same mineral in two or three different forms.

In the statistics of the Geological Survey, the item that Mr. Bell has taken exception to is, I think, properly open to objection. The value of nickel and copper in the nickel-copper matte produced in the Sudbury region should not be valued at the price of the refined metal in the New York market, any more than the price of a shipment of wool should be valued at the price of finished tweeds, or pulpwood at the price of the paper produced from it. I contend that the proper valuation to place on the nickel-copper matte of the Sudbury country is the value at which it would sell at the works at Sudbury, and that is the value which I have endeavored to put on it in the statistics I prepare from year to year. It varies according to the grade of the matte. The value of the copper matte made at Sudbury now is worth more than it was a few years ago, because it is brought to a higher metallic value.

There is a good deal in the way in which you look at statistics. If you have the proper quantity before you, you can fix the valuation. For the purpose of Ontario, I think the value to Ontario is the value of the products at the time they leave the country, and not after all the additional labor has been put upon them in refining them into the actual metals.

Mr. B. T. A. BELL—In reply to Mr. Gibson I may say that in my statement I have, while quoting the figures of the output of coal, coke, pig iron and steel, made a generous allowance for the reconversion which Mr. Gibson has referred to. My figures have never been intended to be complete, but I do contend that they are a fair conservative estimate, suitable for the purposes of this annual meeting.

Major R. G. LECKIE—I quite agree with Mr. Gibson that the first essential is to have the quantity accurate, because values are very, very uncertain. Looking at the statistics which have been presented by the Geological Survey, I see the production of copper is put down at 39,000,000 lbs., and is valued at 11¼ cents per lb. In Canada it is not worth much over 9 cents. The value is continually varying. The production of nickel is put down at 10,000,000 lbs., and the value at \$5,025,000, which is equal to 50 cents a lb. Half that price would be more than the value in Canada.

Mr. HOBART—While I don't want to take back anything I said a short time ago about the standard, I quite agree that quantities are the more important part. The determination of values is a very difficult matter, but if we have the quantities we have the main thing.

Mr. EUGENE COSTE—I am entirely of Mr. Gibson's opinion with regard to the valuation at the mines or works. That very fact explains a great deal of the trouble that seems to be between our secretary and Mr. Ingall. I think that much of that difference is entirely due to repetition in some cases and omissions in others, and that want of system is at the bottom of the whole thing. I have prepared a little paper on "The Collection and Publication of Mining Statistics," and perhaps the present would be a good time to read it. Mr. Coste then read his paper. (Reproduced elsewhere.)

Mr. HOBART—With regard to Mr. Coste's proposition, his point is all very well in one way—the satisfaction of mere curiosity—but it seems to me an unnecessary duplication of figures. The main object of statistics is to serve as a guide to the trade. The man who deals in copper does not care how much ore is produced; what he wants is copper. To go into all these figures of the production of ores is a multiplication of labor, without any useful purpose. The copper, as it comes from the mines, would in most cases have no value at all, unless submitted to concentration or smelting, or

whatever may be necessary. I don't see the object of going into all these requirements, spending a lot of time and money, and more especially the time spent in collecting all these figures, when they are not going to do us a bit of good. I must also differ from Mr. Gibson, as I believe that promptitude is in many cases of more value than absolute accuracy. We cannot expect in any case absolute accuracy as long as we have men to deal with but if we can get it by March 1st, as the Geological Survey has done, it is worth much more to the average dealer, consumer and producer than it would be to have it absolutely accurate a year from now. One man, who deals largely in copper said to me: "I would rather know on February 1st, the amount of copper produced, within 5 per cent., than know the whole total two months later." I think you will find that opinion among all people engaged in trade.

Mr. B. A. C. CRAIG—I think the best way to state value would be to give it at some selling point and state how it had been determined upon. From my experience of Mr. Ingall, I have found him extremely persistent in his demand for statistics and figures. I don't think he has been at all lax, but I do think that almost any ordinary statistical returns that you pick up give little or no information, for the reason they don't set out in detail how they have been compiled. I think that Mr. Coste's suggestion is a good one.

Mr. BELL—Figures after all have but a relative value. The Province of Nova Scotia produced last year four millions of tons of coal but how many people realize what these figures mean to the trade and commerce of the country—the invested capital in land, buildings and plant, in wages, in the purchase of supplies, the rail and water freights, harbor dues and pilotage, in Government revenue from customs and royalty. Something more than a bald statement of figures should be given to the community so as to convey to the public proper estimate of the value of mining as a Canadian industry.

Dr. ROBERT BELL—In order to justify myself, I beg to state that I was the first collector of mineral statistics in this country, collecting them since about 1860. They were published in the *Montreal Herald* for many years and in the *Globe*, Toronto, as well as in the *Mining Journal*, New York, and the *Mining Journal*, London. Therefore I may, perhaps, be excused for taking up your time for a few moments. The difficulty in making accurate statistics can hardly be over-estimated. Anyone who has collected statistics knows it. Mr. Bell and Mr. Ingall are practically agreed as to quantities; the difference is in estimating values. If we are going into values, I think the value should be the worth when converted into some form in which we can compare it with other countries, the first tangible value itself. If you make a ton of iron ore into hair watch springs, it becomes worth \$1,000,000 a ton. I believe that Mr. Bell is entirely sincere in all he has said, believing the same to be true, but it all depends on the way you estimate your values. I don't see why there should be any difference between the figures; we get them officially, and Mr. Bell gets them unofficially.

The SECRETARY—I beg your pardon; I get them officially. You are quite at liberty to examine my authorities. Here they are.

Dr. BELL—If the statistics are right as to quantities, all the rest can be easily adjusted.

Mr. CRAIG—I think there is more in this matter than merely collecting statistics, and without wishing to criticise the department, I doubt that perfection has been obtained by any means. If Mr. Coste would nominate a committee to deal with the matter, I would be very glad to second the motion, because I think it is of immense importance.

Mr. INGALL—I am glad to hear the suggestion of the last speaker, because it will put the suggestions which have been made in such shape that they can be acted upon. I quite agree with Mr. Craig that we are very far from perfection, but we shall get nearer to it if the practical men of the country will embody their suggestions in definite shape.

Mr. GIBSON—The suggestion that a committee be appointed to deal with the matter of statistics is worthy of consideration. It has always been our endeavor in Ontario to present the statistics fully and accurately. We have not always thought in the past, however, that we have been assisted as we might have been by the mining men of Ontario; but by dint of perseverance we have usually succeeded in getting approximately at the point at which we wanted to arrive. I am quite aware that the statistical schedules published by the Bureau of Mines and the Geological Survey at Ottawa are capable of improvement. If fuller details are wanted, we shall be happy to furnish them, if we can get them. If a committee is appointed, I shall deem it a privilege to co-operate with it.



Mr. OBALSKI—As inspector for Quebec, I should like to join that committee and give my experience on the subject.

Mr. COSTE—I don't quite agree with some of the speakers who look upon quantities as the most important point in our mineral statistics. From quantities we cannot make a total; we cannot add ounces, pounds, tons and barrels together. That is one point which, to my mind, forces us to settle down on some system and some values to be adopted in all the provinces of the Dominion, so that we can arrive at a total which will show the state of the barometer, whether it is rising or falling. It should not be very difficult to get at a standard of value. It is simple enough: What is at the mine; what is the state of the industry from year to year. If metallurgical works are increasing and a higher matte produced, we want to know it. It seems to me that the value should be taken at the mine or at the works every year, in the conditions in which the mineral or metal is sold by the works. We are then recording something which is happening at the time.

Mr. HOBART—I would like to ask Mr. Coste: "How are you going to get your values without getting your quantities first?"

Mr. COSTE—There are two ways of getting at values, but the most direct is to get them out of the books of the producer or miner. In some cases the mining men of the country are enlightened enough to understand the value of these statistics, and if they are quite sure that their particular values will not be disclosed and that their productions will only be grouped with others, so that their own business will not be published, in most cases producers, miners and smelters will take the values right out of their books. Very often you know the value better than you know the quantity. By the system I suggest, you can value your ore, your matte and your finished product, and you don't repeat. The great point in statistics, to my mind, is clearness, and by this system you are always clear.

The following Committee was appointed to deal with the main question and to report at the next annual meeting: Messrs. Fergie, Hardman, Coste, Bell, Craig, Gibson, Obalski and Haanel, with power to add to their number.

#### WEDNESDAY EVENING.

The members met at eight o'clock, the President in the Chair.

#### IRON ORES OF MESABI.

Prof. C. R. LEITH of Madison, Wis. opened the session with an interesting address on the "Iron Ore Deposits of the Mesabi district" the subject being well illustrated by lantern projections.

Mr. E. D. INGALL—What is supposed to be the relationship of the Mesabi Rocks to the rocks in the Thunder Bay district of Ontario? I have worked in the latter region and the slides shown were identical reproductions of those we had. I know that you have seen the two districts, and I was wondering what the relationship was supposed to be.

Prof. LEITH—We believe the two regions to be continuous. We have followed the Mesabi material from Gunthorpe Lake to Thunder Bay, and we have no reason for believing that they are not absolutely the same.

Prof. MILLER—We are under much obligation to Dr. Leith for coming such a long distance and giving us this paper. The subject of iron ores is a very important one in Canada at the present time, especially in Ontario; and I think that Quebec has hopes of finding iron ores. The district to the south-west of Port Arthur is being tested. There are two mills at work there for private parties, one of which, I understand, has Senator McInnes at its head, and the other is a Canadian company. The men who are doing work are experienced iron men, who have examined the district thoroughly. I think the district is promising. That is about the only area we have in Ontario that resembles very closely the Mesabi range. We have other ranges which resemble the Vermilion. These ranges practically surround Lake Superior on our side of the boundary. One range can be traced across the district of Nipissing for a distance of about eighty miles, and the western outcrop has attracted much attention lately in the township of Hutton. We are very pleased that an iron man of such high standing as Dr. Leith has come over and made some references to that district. One thing we lack in this country is knowledge of the deposits similar to those of Mesabi. It is no use sending an expert to examine deposits in our northern district who is not familiar with those of Wisconsin or Minnesota, because they are unique. They send out experts from England occasionally to examine these districts, but they don't know much about them. We expect that great interest will be taken in our iron deposits during the next few years. Many deposits were tested last summer in a crude kind of way, and drilling was done on a number of outcrops. The only producer we have at present is the Helen Mine, in the Michipicoton district.

On the motion of Mr. Coste, seconded by the Secretary, a hearty vote of thanks was accorded Professor Leith for his address.

#### MINING IN ONTARIO.

Mr. T. W. GIBSON, Director of Mines,—It is not my purpose to speak at any length on this subject to-night, but I have in my hand the statistics of the mineral production of Ontario last year, and these will form a text on which I shall hang a few remarks to show what progress we have been making in that province during the year. It is not so long ago that people were sneering at the claims of Ontario to be considered a mining province at all. It was looked upon as being pre-eminently an agricultural province, and it is only in late years, comparatively recent years, that its claims to be considered a producer of minerals on anything like a considerable scale have been justified. He submitted the following comparative statement showing the output in 1902 compared with the previous year:—

MINERAL PRODUCTION IN ONTARIO FOR 1902.

| PRODUCT.                                                                                          | 1901.       |              | 1902.       |              |
|---------------------------------------------------------------------------------------------------|-------------|--------------|-------------|--------------|
|                                                                                                   | Quantity.   | Value.<br>\$ | Quantity.   | Value.<br>\$ |
| <b>Metallic:</b>                                                                                  |             |              |             |              |
| Copper.....lb.                                                                                    | 9,074,000   | 589,080      | 9,864,000   | 686,043      |
| Gold.....oz.                                                                                      | 14,293      | 244,443      | 13,625      | 229,828      |
| Iron Ore.....tons.                                                                                | 273,538     | 174,428      | 359,288     | 518,445      |
| Molybdenite.....lb.                                                                               |             |              | 6,500       | 400          |
| Nickel.....lb.                                                                                    | 8,882,000   | 1,859,970    | 11,890,000  | 2,210,961    |
| Pig Iron.....tons.                                                                                | 116,370     | 1,701,703    | 112,687     | 1,683,051    |
| Silver.....oz.                                                                                    | 151,400     | 84,830       | 145,000     | 80,000       |
| Steel.....tons.                                                                                   | 14,471      | 347,280      | 68,802      | 1,610,031    |
| Zinc Ore.....tons.                                                                                | 1,500       | 15,000       | 950         | 11,500       |
| Less value domestic iron ore smelted into pig iron and domestic pig iron converted into steel.... |             | 5,016,734    |             | 7,030,259    |
|                                                                                                   |             | 400,000      |             | 745,000      |
| Net value metallic output..                                                                       |             | 4,616,734    |             | 6,285,259    |
| <b>Non-Metallic:</b>                                                                              |             |              |             |              |
| Actinolite.....tons.                                                                              | 521         | 3,126        | 800         | 6,150        |
| Arsenic.....lb.                                                                                   | 1,389,056   | 41,677       | 1,600,000   | 48,000       |
| Building stone, etc.....                                                                          |             | 850,000      |             | 1,020,000    |
| Carbide of Calcium.....tons.                                                                      | 2,771       | 168,792      | 1,402       | 89,420       |
| Cement, natural rock..bbl.                                                                        | 138,628     | 107,625      | 77,300      | 50,795       |
| Cement, Portland....bbl.                                                                          | 350,660     | 563,255      | 522,899     | 916,221      |
| Corundum.....lb.                                                                                  | 1,068,000   | 53,115       | 2,273,211   | 83,871       |
| Brick, common.....No.                                                                             | 259,265,000 | 1,530,460    | 220,500,000 | 1,411,000    |
| Brick, paving.....No.                                                                             | 3,689,000   | 37,000       | 4,210,565   | 42,000       |
| Brick, pressed and terra cotta.....No.                                                            | 12,846,000  | 104,394      | 19,755,496  | 144,171      |
| Felspar.....tons.                                                                                 | 5,100       | 6,375        | 8,776       | 12,875       |
| Graphite.....tons.                                                                                | 1,000       | 20,000       | 1,923       | 17,868       |
| Gypsum.....tons.                                                                                  | 1,554       | 13,400       | 1,917       | 19,149       |
| Iron Pyrites.....tons.                                                                            | 7,000       | 17,500       | 4,371       | 14,993       |
| Lime.....bush.                                                                                    | 4,100,000   | 550,000      | 4,300,000   | 617,000      |
| Mica.....lb.                                                                                      | 854,000     | 39,780       | 1,986,000   | 101,600      |
| Natural Gas.....                                                                                  |             | 342,183      |             | 189,238      |
| Pottery.....                                                                                      |             | 193,950      |             | 171,315      |
| Petroleum.....Imp. gals.                                                                          | 21,433,500  | 1,467,940    | 21,630,000  | 1,600,000    |
| Salt.....tons.                                                                                    | 60,327      | 323,058      | 62,011      | 344,620      |
| Sewer Pipe.....                                                                                   |             | 147,948      |             | 191,965      |
| Talc.....tons.                                                                                    | 400         | 1,400        | 697         | 930          |
| Tile, drain.....No.                                                                               | 21,592,000  | 231,374      | 17,510,000  | 199,000      |
| Total Non-Metallic.....                                                                           |             | 6,814,352    |             | 7,292,181    |
| Add net value metallic output.....                                                                |             | 4,616,734    |             | 6,285,259    |
| Total production.....                                                                             |             | 11,422,525   |             | 13,577,440   |

The mineral products of Ontario for 1902 considerably surpassed in volume and value the output of any previous year. The total of production was \$13,577,440, an increase of \$1,746,354 or 19 per cent. over 1901. Metallic products contributed \$6,285,259, and non-metallic \$7,292,181, both classes showing an excess as compared with last year's figures.

The chief increases were as follows:

|                         | 1901       | 1902       | Increase  |
|-------------------------|------------|------------|-----------|
| Copper.....             | \$ 589,080 | \$ 686,043 | \$ 96,963 |
| Iron Ore.....           | 174,428    | 518,445    | 344,017   |
| Nickel.....             | 1,859,970  | 2,210,961  | 350,991   |
| Steel.....              | 347,280    | 1,610,031  | 1,262,751 |
| Stone.....              | 850,000    | 1,120,000  | 170,000   |
| Cement.....             | 670,000    | 967,016    | 296,136   |
| Lime.....               | 550,000    | 617,000    | 67,000    |
| Petroleum products..... | 1,467,940  | 1,600,000  | 132,060   |
| Mica.....               | 39,780     | 101,600    | 61,820    |



And the principal decreases :

|                         | 1901       | 1902      | Decrease  |
|-------------------------|------------|-----------|-----------|
| Carbide of Calcium..... | \$ 168,792 | \$ 89,420 | \$ 79,372 |
| Brick, common.....      | 1,530,460  | 1,411,000 | 119,460   |
| Natural gas.....        | 342,183    | 189,238   | 152,945   |
| Pile, drain.....        | 231,374    | 199,000   | 32,374    |

Notwithstanding some slackening of production at the principal nickel mines and works of the Sudbury region, the output of copper and nickel was the largest yet recorded, the former being 17 per cent. and the latter 35 per cent. in excess of the yield for 1901.

In iron ore there was also a large gain, the production increasing in quantity from 273,538 tons to 359,288 tons, and in value from \$174,428 to \$518,445. The bulk of the ore, as in 1901, was raised from the Helen mine, Michipicoton, where other important deposits of hematite are also in course of development.

The production of pig iron was slightly under that of 1901, blast furnaces finding it difficult to procure regular and adequate supplies of coke. The falling off as compared with the product of last year was 3,683 tons in quantity and \$18,652 in value.

The very decided increase in quantity of steel produced from 14,471 tons worth \$347,280 in 1901 to 68,802 tons worth \$1,610,031 in 1902, was mainly due to the starting up of the Clergue works at Sault Ste. Marie.

Building and construction materials in the main show an increase, particularly stone, which includes also crushed stone for pavement use, and cement. The Portland cement industry is being firmly planted in this Province, where immense supplies of the raw materials for its manufacture exist. Eight plants were at work in 1902, and since the beginning of the present year another large factory has come into operation. Three or four others are under construction. In addition, natural rock cement is being made at four different establishments. The total output of cement rose from 489,288 bbls. worth \$670,880 in 1901 to 600,199 bbls. worth \$967,016 in 1902. There appears to have been a falling-off in the production of ordinary building brick.

Mica shows a large proportionate gain, while the output of natural gas has shrunk to little more than half the dimensions of 1901, in consequence largely of the withdrawal of permission to export this article.

The yield of petroleum remained almost stationary. The value given in the above table is that of the refinery products together with the value of the crude used for gas and fuel purposes, in which a much larger share of the product is now employed than formerly.

Mr. COSTE.—I should like to ask why, in the petroleum production, Mr. Gibson has used the finished product figures, instead of the raw material. The figures of \$13,500,000, which Mr. Gibson quoted as the total mineral production of Ontario last year, include the petroleum in the shape of the finished material—paraffin wax, lubricating wax, and so forth. I don't think that is right. You might get your production to \$20,000,000, if you valued the products in that way. It gives a false impression. I would like to emphasise what I stated this afternoon, that there is no system to the thing. We want to know the mineral production of the country. We don't want to take a mineral product and value it up to its last limit, the finished article, and then call that the mineral production of the country; it is not the production of our mines at all. The sooner we realize that, the sooner we know what we are dealing with. There is no use our fooling ourselves, as the saying is, and I think that in this case we do.

Mr. GIBSON.—This question was gone into this afternoon at some considerable length, and I don't think it would be edifying to have a repetition of it. There is a difference of opinion in making up statistical schedules, and a committee was appointed to consider it and make recommendations, and I think that it might very well be left to that committee. One of the values of schedules of this kind is that one year's work can be compared with another, and when you preserve the basis which has been adopted in former years, you can compare one set of figures with another. When you change the basis, you lose that advantage. Figures like these can only be approximate.

On the motion of the president, a cordial vote of thanks was passed to Mr. Gibson, and the session adjourned.

#### THURSDAY AFTERNOON.

The Meeting of the Institute was resumed at three o'clock in the afternoon of Thursday the 5th March.

Mr. Charles Fergie, President, occupied the Chair.

#### ECONOMIC GEOGRAPHY.

Mr. James White, C.E., F.R.G.S. Dominion Geographer, Ottawa, presented a most interesting paper "On Economic Geography."

At the conclusion of his paper Mr. White said, pointing to the handsome map of the Dominion on the wall, recently published by the Department of the Interior: This map will be used to a certain extent in connection with the Economic Atlas. Before I left Ottawa I saw the Minister of the Interior and he gave me permission to say that a copy of this map properly mounted will be donated to the Institute, and that an unmounted copy will be sent to each member of the Institute.

The PRESIDENT (Mr. Fergie) said. We are all much indebted to Mr. White for his interesting and instructive paper and especially for what he promises in the future as regards maps and diagrams, which will be no doubt of inestimable value.

Major LECKIE—I heard Mr. White's paper with a great deal of pleasure for it gives us a clearer idea of the resources of the country than we had before. The development of those resources come quite within our scope as an Institute. The water power of Canada is unrivalled in the world. I have been in Norway and Sweden for some years past, and after what I saw there I can say that Canada eclipses the world in the matter of water power. Really our water powers are the equivalent of our coal fields. Take the Sault and there you have the whole of Lake Superior as a mill pond, and the power that can be made available there is incalculable. It is equal to, I do not know how many thousands of tons of coal per year, and we have in all those rivers from Lake Superior to New Brunswick a water power which must represent an enormous amount of fuel. In the Lake Superior district and in North Ontario we have no coal but we have the equivalent in enormous water powers. The Department of Government which Mr. White represents is doing an immense service to Canada in bringing these things before the country.

Dr. GOODWIN—There is an interesting incident known to some of us which illustrates the point that water takes the place of fuel to generate power for mining and other purposes. Some of you who know the Cordova Mine know the amount of wood and coal that it took to generate power, but within a recent period they have developed a water power two miles away, and now they are independent of the coal barons to the south. That is a beautiful illustration of this very point, and that will be repeated over and over again in Canada as time goes on. In that way we solve the problem of cheap fuel.

Mr. WHITE—The branch of the Department of which I have the honour to be the head is to a large extent a new thing, and our first piece of work has been the large map of the Dominion. We also produced a smaller one on a scale of 100 miles to the inch. From this time forth we propose to develop as far as possible on the lines of commercial geography with the view of advertising the resources of the country. If we can place a copy of the Economic Atlas in each business house in Great Britain and the United States, it will do more to advertise Canada than anything else I can think of. If we can do that, it will be a revelation to 99 per cent. of the people of Great Britain and of the American Republic.

Mr. COSTE—I would like to congratulate the Canadian Government and the country on having secured my friend Mr. White for the position he now occupies at the head of this Topographical Branch. Some years ago Mr. White and I were on the same Survey and I learnt then to appreciate his ability. The difficulties before him are, no doubt, very great, but I have no fear but that he will overcome them. The importance to the country at large of first-class maps is self evident, but it is especially evident to those who have tried to make surveys with the existing maps and know their deficiency. The state of our maps has been deplorable up to date. I would like to ask Mr. White if a geodetic survey of the whole country is to be undertaken before long, so as to lay the foundation for very correct maps? I would like to see the work undertaken by the Dominion Government in a systematic way.

Mr. WHITE—I cannot really say whether the Department proposes to undertake a geodetic survey of Canada. For a great many years to come we will have to depend on what are called geographical surveys. These surveys carried on in the past have not been what they should be, and the information on our maps hitherto has not been as detailed as it should have been. What Mr. Coste refers to can only be accomplished by the expenditure of more money, but I have every reason to believe that it will come in time. The geodetic survey means the carrying of a triangulation over the whole country which is a very slow process indeed. There is no use in



having one Department doing a lot of work and another Department doing other work and overlapping each other. What I have always advocated was the formation of a Geographical branch which would undertake all this work and go into it with ability and expedition. The present system of letting the work out to different Departments results in a waste of time and a waste of money.

On the motion of the President a cordial vote of thanks was tendered to Mr. White for his valuable paper.

#### THE STEWART RIVER GOLD DREDGE.

Mr. A. W. ROBINSON, C. E., of Montreal, presented his paper "On the Stewart River Gold Dredge" (reproduced elsewhere.)

Mr. J. E. HARDMAN—Might I have permission to question Mr. Robinson with regard to one or two technical points. He told us that his dredge was of the Californian type rather than the New Zealand type. Might I ask him whether these holes in the screen are of uniform size or whether some are smaller and some larger than the others. Those of you who read the Canadian Mining Review of last month may have noticed a comparison in the methods of dredging between the New Zealand type and the American type and the expression of opinion given thereon. Might I ask if the buckets in the Stewart River Dredge are close together, and if not, what is the distance approximately between the bucket pins?

Mr. ROBINSON—The holes are from an inch to three inches and are not of uniform size; at the lower end there are a few holes six inches by three. The size of the holes depends largely on the size of the stones to be dealt with. The buckets are open spaces with intermediate links and the capacity of the bucket is two and a quarter cubic feet. I was the first one to introduce the close bucket type for dredges built some years ago in Montana. Those who used them seemed to like them, and they claim that they work at bed-rock better than the buckets further apart. There are arguments in favor of both sides, but close buckets are heavier than the other system and not as well adapted for lifting big stones. Accidents happened on the Montana dredge by big stones getting between the buckets, but in this type of bucket that does not happen.

Major LECKIE—A year ago I was in New Zealand and saw the dredges at work there. The rivers are rather deep in that country and the sand free from boulders, so that they could use a different type of dredge. My friend Mr. Errington, when he was up the Vermilion River in our Northern Ontario, found that there were a great many large boulders in the bed of the stream which would prevent the use of the New Zealand type, although on certain other rivers they might advantageously be used. It would appear that the machine would have to be modified to suit the conditions of each river. I was very much pleased to hear this paper read by Mr. Robinson. I happen to know the President of the company very well and I know that the financial affairs are in the best of hands. If this dredge does not succeed, considering the financial and mechanical skill displayed, then there is very little hope for success in that business.

Mr. ERRINGTON—What size of boulders are handled, and is the ground loose or solid?

Mr. ROBINSON—I think the gravel is comparatively loose. Of course we do not know what is beneath the surface, and as they have to work over a good many miles of river they would encounter all kinds of material. I may say that the dredge can come up against immovable rocks without injury to itself. We handle stones in that dredge up to 18 inches in diameter and pass them through.

Mr. ERRINGTON—How would you do when you came to large boulders? Do you work around them or up against them?

Mr. ROBINSON—You have to do the best you can, but in the hands of a skilful man there is no danger.

Mr. ERRINGTON—The gold on the Vermilion River is coarse enough to look at, but in reality it is comparatively fine; it is sort of flakey. On account of there being such large boulders there I was not aware that you could make any headway with a dredge of that kind.

A cordial vote of thanks was tendered to Mr. Robinson for his valuable paper.

#### REMARKS BY DR. LEDOUX.

The PRESIDENT—We have with us this afternoon a very distinguished visitor in the person of Dr. Ledoux, of New York, President of the American Institute of Mining Engineers, and I wish you to join with me in giving him a very hearty welcome.

Dr. LEDOUX, who was warmly received, said: I thank you in the name of the American Institute of Mining Engineers for welcoming me to your meeting. I have been a member of this Institute for a number of years

and I always have great pleasure in attending your meetings. One of the most pleasant things is that you find so many men of one Institute who are members of the other. The relations of the American Institute with the Canadian Institute are most cordial and most friendly and they have been working largely on the same lines. I again express my pleasure in being with you.

#### ON THE MODERN BLAST FURNACE LABORATORY.

Mr. W. DICKSON CRAIG, of Midland, Ont., presented a most interesting paper "On the Modern Blast Furnace Laboratory and its Work."

The PRESIDENT—There are some chemical gentlemen connected with the Institute who are fully competent to discuss Mr. Craig's paper, but I regret they are not in the room at present.

Dr. LEDOUX—I have been making some notes while Mr. Craig was reading his paper, not because I had any idea of discussing it but in order that I might get some ideas for the laboratory in New York. I remember that in the laboratory in London they had extraordinary difficulties in their assays. They had their balances tested and tried everything to discover what the difficulties were, but at last they found that it was in some way connected with the electric light which affected the balance. When the light was some distance from the balance, one arm of the balance or the other would be suspended or lengthened, but when they did away with the electric lamp all these discordant results disappeared. I mention that as showing how careful we must be about the construction of the laboratory, and how we should watch the effects if it is illuminated with electricity. The desideratum is to get the light near enough to have the full benefit of it, and at the same time not too near to get heat from it. With regard to the floor being cemented we tried that in New York but we found in time that the friction would wear away the cement and our experience was that a very hard asphalt makes a better floor. The arrangements of the windows in the laboratory is a very important matter because you want to get light, and at the same time be able to keep the windows opened without having the wind blowing over the desk. As to the sampling of cargoes of iron and ore that is the most important point Mr. Craig has raised. If your sample is wrong there is no use making a careful analysis of it. I know that conscientious assayers have to meet competition from men who simply take a cigar box and fill it from a cargo and then say they have a proper sample. You cannot have too large a sample and, facilities for preparing it are equally essential. There are many ways of sampling cargoes of iron and ore besides merely taking a shovel full out of every tenth bucket. The old method of having a rod with knots on every two feet and having a man take a lump however small it might be, and putting it in the sample pile gave you a very fair sample. I am delighted to hear that in Mr. Craig's case they have taken such pains with their laboratory. Not only is it important for the works themselves to have the best analysis, but it is a matter of importance for those who sometimes have to stand between the buyers and sellers of ores and their products—sometimes we find that no matter how painstaking a man may be, another man may not be so painstaking and the tendency naturally is for each man to think that his own analysis is right.

Dr. GOODWIN—I am glad that interesting papers of this character engage the attention of the Canadian Mining Institute. I say that because I am a chemist myself, and I believe that we do not have half enough chemistry talk at our meetings. I generally hear discussion about geology, and mining, and machinery, but very little about chemistry, and we all know that chemistry is a most important branch of the mining industry. Mr. Craig's description of the methods which have been adopted at the Midland Iron Furnace has value in several respects. In the first place it will be a valuable paper for students to consult in order to give them a clear idea of the kind of work they will have to undertake when they get into business themselves. The description of the methods which can be carried through in twenty-four minutes or half an hour will give the student a clear idea of the rapidity into which he will have to altar his slow fingered work while he is at the scientific school. Mr. Craig's suggestion as to what the Government might do in encouraging the selection of standard samples is most important. The description of the laboratory I found very interesting, and, like Dr. Ledoux, I made notes of the suggestions which perhaps I may be able to embody in improvements which are to be made in our own laboratory in Kingston. We are all much indebted to Mr. Craig for this interesting paper.

Mr. GEORGE E. DRUMMOND—I listened with very much pleasure to the able paper of Mr. Craig and I am pleased to know that Dr. Ledoux was able to express his commendation of the work we are trying to do at Midland. We have a great deal to do there before we make ourselves per-



fect, but there is one thing which I am sure you will have noticed and that is that we have a good chemist (applause). The chemistry of the thing is what we want to get down to in this country, and for that reason many of us who are engaged in manufacturing are beginning to take an interest in technical education. We have suffered in Midland, and I suppose others have suffered also, as to the methods adopted for sampling at the port of shipment as against the methods adopted at the port of delivery. The question of uniformity is a very important one. Chemistry is most important in our business and the manufacturers are beginning to realize that. In trying to make our laboratory at Midland as perfect as possible we feel that we are going on the right line. We try to have a good Superintendent and good workmen, and having heard our chemist you will see that we have succeeded in getting a good one.

On the motion of the President a cordial vote of thanks was tendered to Mr. Dixon Craig, for his paper.

#### ON SOME POSSIBILITIES IN CANADIAN MINING.

Mr. FREDERICK HOBART, M.E., of New York presented his paper on "Some Possibilities in Canadian Mining," (reproduced elsewhere in this Review.)

#### ON MINERAL STATISTICS: CANADA AND UNITED STATES COMPARED.

Mr. GEORGE E. DRUMMOND, presented a paper by Mr. George Johnson, Dominion Statistician, giving a comparison of statistics of mineral production in Canada and the United States.

Votes of thanks were tendered to Messrs. Hobart and Johnson for their contributions to the transactions at Institute.

#### THURSDAY EVENING SESSION.

The members met at eight o'clock. Mr. Charles Fergie President in the Chair.

#### THE VOLCANIC ORIGIN OF NATURAL GAS AND PETROLEUM.

Mr. EUGENE COSTE, E. M., Toronto presented a valuable paper on the subject of "The Volcanic Origin of Natural Gas and Petroleum."

Dr. ROBERT BELL—Mr. Coste has made out a theory that there may be a connection between petroleum and gas and organic phenomena, but I expected he would go further and show how all the elements are derived; how from the disassociation of the elements of other substances petroleum is formed.

Mr. COSTE—I do not pretend to be enough of a chemist to explain all the phenomena I have referred to. It is a pretty complicated problem, and I am afraid that we do not know much about the extent of the reaction which takes place down below. The only thing I point out is that we clearly see in the volcanic emanations these hydrocarbon problems producing the sulphur and these chloride emanations which we collect right from the lava itself, and the analysis of chloride sodium, carbonic acid, etc. There is no doubt at all that all these gases are contained in the lava itself and contained in the same way in the fluid magma emanating from these volcanic districts. I leave to future generations to say what the reactions are down below; I concern myself only with the geological fact.

Major LECKIE—We are all indebted to Mr. Coste for his very erudite paper, but I think it tries to prove too much. All these oils are not of regular chemical analysis. They vary in their constituents and in the proportion of their constituents. While not desiring to controvert this theory of volcanic origin, I think that there are evidences of oil having been produced from the shales. Take the Albertite in New Brunswick: Through the bituminous shales there, there are regular fractures and these fractures are filled with solidified petroleum. There is evidence that it has filtered in from the bituminous shale through which the fracture runs.

Mr. COSTE—There was pressure that would drive it in through the shales.

Major LECKIE—It does not require any pressure.

Mr. COSTE—You may drive anything through shales with weight.

Major LECKIE—We find that the fractures are filled by a regular infiltration. I can remember a discussion in this city at a meeting of the American Institute of Engineers when Mr. McFarlane, Chief Analyst of the Government, took the ground that a great deal of this natural gas and petroleum in Pennsylvania was that the result of the volatilization of the volatile matter of the bituminous coal; the conversion of bituminous coal into anthracite.

Mr. COSTE—There are millions of barrels of oil away down under the coal.

Major LECKIE—I think the oil has a different origin and that is very evident from the manner in which we find it to-day.

Mr. MICKLE—I would like to put this question as a conundrum: What is the difference between a man who believes in the exclusively vegetable origin of coal and a vegetarian.

Major LECKIE—That is a puzzle.

Mr. HARDMAN—Perhaps Mr. Mickle can answer that himself.

Mr. MICKLE—The man who believes in the exclusively vegetable origin of coal is prepared to swallow anything, and the vegetarian draws the line at meat. (Laughter).

Mr. COSTE—We have different beds of gas only 125 ft. apart, and they have been there for aeons of ages and yet the pressure has remained different as we find by our guages. That cannot be controverted in any manner, and that shows absolutely the imperviousness of these fissures. It is not all shale between; it is an impervious sandstone. It is impossible, as I pointed out in the paper, to imagine that these gases and oils which, have travelled side ways to the Anticlines, had been brought there without any pressure whatever to drive them. How could they travel through such strata as that, where they will remain for ages in that way without mixing at 125 lbs. difference of pressure between two strata only 125 ft. apart.

Dr. ADAMS—We are indebted to Mr. Coste for his very able paper. It contains so much that may be discussed with profit that we can hardly hope to do it justice within the time allotted to us. It is a paper which should be discussed by correspondence by each of us writing what we think on it, and having that put in as an appendix to Mr. Coste's paper. There is one thing which strikes everybody, and that is, that the paper has been written by a gentleman who has been educated in France. We find that at the very earliest times the French geologists had always had the greatest respect for the earth's interior which none of us know anything about. For instance, in the case of the granite, when we get the granite through the shale we say that the granite came up in a liquid condition.

Mr. COSTE—That is not in my paper.

Dr. ADAMS—It is not, but Mr. Coste has derived from the earth's interior coal oil and all other things, and it is part and parcel of the same theory. We ought to be very thankful to Mr. Coste for the paper in which I can safely say he has got together every single fact that can be adduced in favor of the Volcanic Origin of Petroleum, and a good many which cannot be adduced in favor of it. With regard to the albertite, it seems to me plain that it is not volcanic at all. You have a series of shales in the Devonian of fossil fish which is supposed to be the origin of bitumen. In that case there is an anticline; on the side the shale broke as it naturally would and probably that was arched slowly. The crack was developed slowly, and probably ages elapsed from the time the crack first opened until we get it in the present condition. When you take the shales and turn them over slightly you find that the bitumen shows out. If you have this crack opened in a mass of shales saturated with bitumen, it seems to me it is reasonable to suppose that a certain amount will slowly ooze out of the crack, and as the crack widens it will fill up. There is no evidence of volcanic action about that. When they started the mine it was supposed to be coal and when they cut down the fine rock fissure vein that came out to a thin edge and disappeared instead of getting wider as it ought to if the stuff had come up. The company closed the works and the whole thing came to an end. It is impossible to try to explain any occurrence like that by the theory of emanations from below.

Mr. COSTE—The very fact that Dr. Adams has pointed out that the shales are impregnated with bitumen phenomena shows that the albertite vein was not formed by the drainage from the shale into the vein, because if it was there would be no petroleum in the shales now. If the oil of the shales drained into that fissure there would be no more in the shales. Show me in nature to-day where fossil fish produce oil. You have no right to admit that they produced oil in the lower carboniferous time when you cannot show it to me to-day. You cannot show me any place to-day where the bodies of the fish are entombed; they are decomposed.

Dr. ADAMS—If I could take Mr. Coste down five or ten miles under the earth's crust I think I could show that process but unfortunately because our spirits are harboured in bodies that cannot pass through shales I cannot prove it. Perhaps in another world under more favourably conditions I can prove that.

Mr. COSTE—If they are not entombed at the time the formation is made on the sea shore how can you get it afterwards.

Dr. GOODWIN—I should like to point out that the human mind is prone to prepossession. There are illustrations of that on every hand and I



am very much inclined to think that geologists have a prepossession in favor of the organic origin of carbon and hydrocarbons in nature. That prepossession is very natural. The origin is that in nature as we have it on the surface of the earth, we cannot disassociate carbon and hydrocarbons from the leaf matter, so we say we get our carbon and our hydrocarbons, everything except carbon dioxide from this leaf matter and it is natural for geologists to rush to the conclusion that all these materials which we find in the crust of the earth have ultimately an organic action, lending a sort of appearance to the prepossession of which Mr. Coste has been accused.

Dr. ROBERT BELL—I beg to move a vote of thanks to Mr. Coste for his paper. I do not think I ever in my life listened to a more interesting paper. As Dr. Adams has suggested, the members of this Institute should give their opinions on it by correspondence and this correspondence including Mr. Coste's paper would make a pamphlet of very great interest.

Mr. MILLER—I beg to second the vote of thanks to Mr. Coste. We are very proud of Mr. Coste in Ontario and as Toronto is his City I think the Institute might have one meeting there if only for educational purposes to let the people know what kind of an Institute we have. There are a great many questions asked about what we are by politicians and legislators. A great many people in Ontario seem to believe in the volcanic theory. We see that Professor Meikle believes in it: and he made up that conundrum at the time he was discovering the anthracite at Sudbury (Laughter). I had occasion to examine the well which they are putting down and when they got to the granite, I told them that it was time to stop but they went on and are going on still. They seem to think they will get oil down there. It reminds me of the story of the farmer who was digging in the ground and was asked if he was looking for a ground hog. He answered no, but he continued to dig and when he was asked: "What do you think you will get," he replied; well if I keep on I will get oil, hell, or China. (Laughter.)

The thanks of the Institute were accorded to Mr. Coste.

#### THE EXAMINATION OF MAGNETIC ORE DEPOSITS BY MEANS OF MAGNETIC MEASUREMENTS.

Dr. EUGENE HAANEL—Dominion Supt. of Mines, Ottawa, was down for a paper "On the Principles Underlying the Determination of the Location and Extent of Magnetic Ore Bodies by Magnetic Surveys." Dr. Haanel announced at the opening of his address: I have changed the title of my paper. I find it would be scarcely of much value to speak in a summary way on the principles underlying the method, and as I wanted to make the paper more practical I have changed the title to "The Examination of Magnetic Ore Deposits by Means of Magnetic Measurements."

Dr. HAANEL delivered a most interesting and erudite address on his subject, which he illustrated by diagrams on the black board.

At the conclusion of the address

The PRESIDENT said: We are indebted to Dr. Haanel for his interesting and instructive paper. I am sorry we had not an opportunity to call upon him earlier in the day when we could have given him more time. Under the circumstances I do not think we have enabled him to do justice to his subject. There is no doubt that he has made the very best of it in the short space of time which he has had at his disposal.

Mr. INGALL—Dr. Haanel has given us an outline, and a very interesting one, of a handbook which he is going to write on this subject. I may say that he has got all the information that he could possibly get in such concise shape, that those of us who wish to follow up the Swedish method will have something to show us exactly how things may be done. I have no doubt that Dr. Haanel's book will be of great value to the mining men of this country. I have always held that in the Kingston and Pembroke districts, for instance, where there are so many bodies of magnetite, that had magnetic surveys been made many deposits would have been brought forward to our great profit. The information which Dr. Haanel will impart in his book will doubtless be of great use to the mining people of this country.

Mr. MICKLE—Could Dr. Haanel tell with certainty the difference between a mass of rock 20 or 30 per cent. magnetite near the surface, and a body of magnetite at any depth below the surface?

Dr. HAANEL—I have indicated that it cannot be done in a case of that kind. That can only be done by boring.

Dr. GOODWIN—I realized last summer the importance of this method of magnetic survey. Dr. Haanel's clear and lucid explanation of the principles of this survey has removed certain doubts from my mind which I had as to its applicability. I trust that what Mr. Ingall has said about the publication of the hand book does not mean that we are not going to have the honour of publishing this paper in our Journal, because I think it would

be very important indeed to have it published in the Journal of this Institute so that it may receive the widest possible circulation. (Hear, hear. I have much pleasure in moving that the thanks of the Institute be tendered to Dr. Haanel for his very important paper.

Dr. PORTER—I have much pleasure in seconding the vote of thanks to Dr. Haanel, and in doing so I should like to speak of my own experience in attempting to learn something of this method. I am not able to read the Swedish work on the subject in the original, and I have had considerable difficulty in the last year or two in getting any satisfactory information on the subject. I tried in England and Germany and failed. At McGill University, Dr. Adams and I have both appreciated the importance of this Swedish method and I might say that the Geological Department, under Dr. Adams, has recently procured some of the most modern apparatus for this magnetic survey and we are putting it in as a very important part of our Geological course. I think this field has been very much neglected until recently in this country, and we want to make the very best effort we can in the future to remedy our omissions in the past. Dr. Haanel's book will be welcomed not only by people who teach, but by many people in the field. I have had from my old students and from others many enquiries within the last year as to where in the world they could get information with regard to this method of survey, and heretofore I have had to send them a long list of very unsatisfactory references. I hope when Dr. Haanel publishes his book that I will be able to send them a single reference which will not be unsatisfactory.

The vote of thanks was enthusiastically passed.

The meeting adjourned at 11 o'clock to meet on Friday morning.

#### FRIDAY MORNING SESSION.

The Institute met at 11 o'clock on Friday morning in the library. Mr. Charles Fergie, President, occupied the chair.

An informal discussion took place as to where the next annual meeting should be held, but this discussion was renewed afterwards on a motion to hold the meeting in Toronto as appears by the report later.

#### ELECTION OF OFFICERS.

The scrutineers having examined the ballots, reported that the Officers and Council (see last number REVIEW) selected by the nominating committee had been elected.

#### MR. COSTE TAKES THE CHAIR.

Mr. B. T. A. BELL—It is now in order that our new President, Mr. Coste, who by the declaration of the ballot, will fill the office for the ensuing year, take the chair. In Mr. Coste we have one of the oldest consulting mining engineers in Canada, and a gentleman who has consistently earned a very high reputation as an engineer and geologist. (Applause.) In so far as the proceedings of our Institute are concerned we may congratulate ourselves upon having on record two papers from him which are decidedly unique and original and distinctly creditable to Mr. Coste and to our Institute. (Applause.) I have great pleasure in moving that Mr. Coste now take the chair.

Mr. COSTE then took the chair as President of the Institute and was received with hearty applause and congratulations. He said: I thank you very much for the honor you have conferred upon me in electing me to be President of the Canadian Mining Institute, a position which has always been worthily filled by men of distinction in the past. My only fear is that I may not be able to discharge the duties of the office so well as my predecessors have done, but I assure you that I shall do my best. (Applause.) With due regard to your choice I think you could have selected a better man, and indeed I see around me in this room many gentlemen who I think are more fitted for the position than I am. I should like to make a few brief remarks as to the progress of our Institute during the past few years. The figures given in the report of the Council show that we are in a very healthy condition indeed. We have now 453 members and our official publications are very creditable to the Institute and to the mining men of the country. Indeed, I may say, that from year to year our publications are improving all the time. We have always held good meetings and that is one of the things necessary to keep matters going. We also have a very satisfactory financial statement to present and a substantial balance on hand. We owe that in large part to the kindness of the Dominion Government in granting us an extra \$2,000 last year and it is fitting for us to record our appreciation of this grant and to thank the Honorable Mr. Sifton, Minister of the Interior, for his kindness in that regard. We can also express the hope that at least the same grant will be renewed for next year. We want to get at least as much money as we had last year, because as our Treasurer



has pointed out, we have a good deal more to publish this year. In the discussion which took place, speaking about a meeting in Toronto, I referred to the fact that in Ontario they have never seen this Mining Institute, and some people there imagine that there is no such thing as a Mining Institute or no body of men chartered into an Association which represents the mining interests of the whole country from one end to the other. From that idea arose a very queer situation which was called to our attention in time by Mr. Bell, the Secretary, and fortunately Major Leckie was in Toronto, and there was a corporal's guard of us to tell the people up there that they should not imagine that they had credentials from all over the country. They had the gall to appoint a Credential Committee in Toronto and to represent themselves as a representative mining body of the Province. I think that is partly due to our mistake in not having occasional meetings in Toronto, and I trust that the suggestion made to have a meeting there will take shape. We will have a very fine new hotel there next year and you could not go to a better place. I conclude by thanking the members of the Mining Institute for the honor they have done me. (Applause).

#### THANKS TO MR. FERGIE.

Mr. J. STEVENSON BROWN—It would be in order now for some mining man to propose a vote of thanks to Mr. Fergie, who has so well presided over the Institute during the past year. I know something of the services which Mr. Fergie has rendered and I know that at very considerable inconvenience to himself he has travelled very long distances on several occasions simply to attend our Council meetings, a fact which shows that he took great interest in the society.

Mr. HARDMAN—Our treasurer desires that this motion should come from a mining man and in compliance with his request I have much pleasure in moving that the thanks, the most cordial thanks of the Institute, be given to Mr. Charles Fergie for the able manner in which he has presided over our meetings during the past year.

MAJOR GEORGE SMITH, M. L. A., seconded the motion.

The PRESIDENT—(Mr. Coste) In speaking of the progress our Institute has made during the past year, I should certainly have mentioned that this progress was due in large part to the efforts of our President Mr. Fergie. I ask you gentlemen to pass that motion with hearty applause.

The members of the Institute enthusiastically endorsed the motion.

Mr. HARDMAN—I beg to move that the thanks of the Institute be tendered to the Secretary and to the Treasurer both of whom have rendered valuable services and have been present at every meeting of the Council.

Mr. A. W. STEVENSON—I second that motion. It makes a very strong combination for the good of any society when you have such a Secretary, such a Treasurer and such a President as we had last year. I have no doubt that our Institute will continue to grow and increase and that we will have a membership of 1000 instead of 500 as at the present.

The motion having been put by the President it was cordially received and the thanks of the Institute were tendered to Mr. B. T. A. Bell, Secretary, and to Mr. J. Stevenson Brown, Treasurer.

Mr. B. T. A. BELL—While votes of thanks are in order we must not forget the services rendered to the Institute during these meetings by Dr. Porter. He has gone to great personal troubles to provide us with the use of an excellent lantern and in many other ways he has done much to promote the success of this gathering.

Mr. HARDMAN seconded the motion which was adopted.

The PRESIDENT in tendering the thanks of the Institute to Dr. Porter said that every year they had met in Montreal they had experienced uniform kindness from him.

Mr. B. T. A. BELL—With regard to the proposal to move a vote of thanks to Honourable Mr. Sifton for the grant to the Institute, I may say that the Honourable Mr. Fielding has also been very considerate to us. We have already expressed in very clear and precise language our appreciation of the Government grant, and we all hope it may be renewed.

#### TORONTO FOR NEXT ANNUAL MEETING.

After some discussion a motion was passed recommending to the Council the desirability of holding the next annual meetings of the Institute in the city of Toronto.

#### MONTREAL BRANCH OF QUEBEC MINING BUREAU.

Mr. T. J. DRUMMOND—We have felt for a long time in the City of Montreal that it was very desirable and there should be a branch in this City of the Mining Department of the Quebec Government. A great many people who visit Montreal and who might be interested in our mining development

often do not find it convenient to go to Quebec City, and if we could have the mining exhibits and information here it would be a great assistance. I beg to move seconded by Mr. Stevenson:

"Resolved that this institute through its officers urge on the Government of the Province of Quebec the necessity and importance of establishing in the City of Montreal a branch office of the Department of Mines. Such branch office to contain all necessary exhibits maps and other information in regard to the Mining interests of the said Province, and to be the Head quarters of the Director of Mines of the Province of Quebec, and under his immediate supervision. This Institute being of the opinion that the establishment of such an office in the City of Montreal would be in the interests of the Province of Quebec and of the Dominion at large."

I do not believe that it would at all interfere with the Mining Department if the Provincial Inspector of Mines had his headquarters in Montreal. If he were here it would be possible to get this information for those interested in mining matters who visit Montreal, and they could see at great convenience to themselves the exhibits and plans and maps. The carrying out of this resolution would entail little or no expense upon the Government. I believe that if the Institute passes this resolution it will be favourably considered by the Provincial Government.

Mr. A. W. STEVENSON—There is no politics in this; it is simply a business consideration. We have already interviewed the Quebec Government and they appear to be generally in favour of the proposition, but of course we have a very economic Government in this Province, and it may be that the question of possible expense bothers them more than anything else. An expression of opinion by this Institute might help the Minister in arriving at a decision.

Mr. OBALSKI, Inspector of Mines, Province of Quebec—I would like to say a few words on the question as I am somewhat interested. I find quite an unanimity of opinion on this subject, and I have been approached by several members with a view of getting my opinion. Some years ago I had some objections to come to Montreal for a private reason, and also because I had charge of the Administrative work of the Department. Now we have a very efficient officer in Mr. Coté who has charge of the administrative part of this branch. Our province as you know extends from Temiscamingue to Gaspé, and I think it would be very convenient for the mining community and for people visiting our country to have an office here. For my part I would be willing to come to Montreal. I have been twenty-two years in the service of the Government; I have done my best in the past and I intend to do the same in the future. I have no doubt but that the Government will consider this matter carefully.

The PRESIDENT—You all seem to agree on this point and I myself believe that it would be a great benefit to mining interests if we had an office of the Inspector of Mines for Quebec in Montreal.

The resolution was adopted unanimously.

#### STUDENTS' AWARDS.

The SECRETARY—I wish to make an announcement with regard to the Students' competition. I think that the committee on awards would be more effective if it is a small committee. We have divided the awards into three classes. It is one of the perquisites of being the President of the Institute that he has to give a gold medal every year, and the President's medal is given for the best paper contributed during the year. We have divided the subjects, one under Mining, one under Ore Deposits and Geology; and the other under Ore Dressing. I would suggest that the awards in the mining and metallurgical section should be left to Messrs. Coste and Hardman, and that the geological section awards be left to Dr. Adams of McGill, Prof. Walker, of Toronto and Dr. Goodwin of Queens. I think this will make a very good committee.

The PRESIDENT—In regard to the medal I may say that I will be very pleased indeed to contribute the usual medal and in fact I look upon it as an honor to be allowed to do so.

The Committee named by Mr. Bell was appointed.

#### FRIDAY AFTERNOON SESSION.

The Institute re-assembled on Friday afternoon at 3 o'clock.

The President, Mr. Coste, occupied the chair.

#### NICKEL DEPOSITS OF NEW CALEDONIA.

Major R. G. LECKIE, of Sudbury, Ont., read his interesting paper, "On the Nickel Mines of New Caledonia." Major Leckie spoke from a personal examination of the mines and gave facts and figures of deep concern to the nickel industry in Canada. He also exhibited some very interest-



ing photographs of the mines and their working, which were taken on the ground.

The PRESIDENT—We are all deeply indebted to Major Leckie for his paper, which is so interesting, and so much to the point, there being a similar association of rocks with the nickel found in our own country.

Major G. R. SMITH—I have listened with the greatest interest to what Major Leckie has said in connection with the nickel mines of New Caledonia, and with the hope, as he suggest that it may lead to some further development of our deposits in the Eastern Townships, although I am frank enough to say that there does not appear to be enough work done in the Eastern Townships to start a company on yet. When we see that they are working with such low grade ores in Caledonia there is no hope for us.

Prof. MILLER—Major Leckie is well qualified to give us a description of the New Caledonia mines, and to make this comparison with Quebec on account of his earlier experience in that province. I must say that it is a very valuable comparison indeed. It is always interesting to have our own mines compared with those of other places, even if we have not found very much in any one locality in Quebec yet.

Prof. MICKLE—Did I understand Major Leckie to say that there were a great many nickel deposits in New Caledonia that are still undeveloped.

Major LECKIE—Oh no.

Prof. MICKLE—But none of them extend to any depth.

Major LECKIE—No.

Prof. MICKLE—Would the quantity be immense.

Major LECKIE—Oh yes. There is one place where the International Nickel Co., bought about 8,000 acres all covered with more or less of this silicate of nickel. There is no blasting required there; it simply is necessary to have an efficient Chinaman to pick it up. The work is done by pick and shovel.

The PRESIDENT—How many miles does the range extend?

Major LECKIE—The known range is about three quarters the length of the Island, or 380 miles; it is very continuous.

Mr. EVANS—Do I understand that the depth of the deposit is about 20 feet.

Major LECKIE—Yes; and after that you get into the pure serpentine.

Mr. EVANS—20 feet would be the maximum.

Major LECKIE—Yes; 20 feet or 25 feet would be the maximum.

Mr. FERGIE—How would you compare these mines with the mines in Canada.

Major LECKIE—The best mines in New Caledonia would hold their own with the best mines in Canada. There are only one or two mines in Canada that would equal them in cost of production.

Mr. FERGIE—I understood you to say that there was 25 per cent. of moisture in the New Caledonia ores.

Major LECKIE—Yes; from 10 per cent to 25 per cent. There is no water in the Canadian; it is a hard sulphide.

Prof. MICKLE—Not the Canadian but the New Caledonia, because it is free from sulphur and phosphorus. The only metal associated with nickel there is iron so that if it were smelted you could form a ferro-nickel. Experiments have been made and it yielding ferro nickel carrying 48 to 52 per cent of nickel and the balance iron. There are immense quantities of iron there. The difficulty in making the ferro-nickel from our Canadian ores is the amount of sulphur they carry, and also copper. Because you could make a ferro-nickel for the use of steel-makers you must have it entirely free from sulphur which is fatal to steel. Copper also is very injurious to steel. You could use up to one-tenth of one per cent of copper but it is a very costly thing to get rid entirely of the copper from the matte. Dr. Mond extracts the sulphate of copper and then treats the residue with the carbonic oxide and dissolves the nickel in that way and a certain amount of iron is carried over with the nickel. But if the matte can be brought into a condition where nothing remains but iron and the nickel you could then fuse that at once and make a ferro-nickel and save a very costly process, namely, the fusion half a dozen times with the sulphate of soda in order to separate the nickel from the copper. The ores of New Caledonia being quite free from sulphur and copper and phosphorus they lend themselves very readily to the production of ferro-nickel of high grade.

Major LECKIE—Formerly the French Company did some smelting in New Caledonia, and the product was rather an infusible mixture. We know that the silicate of any metal is rather difficult to work; it is not like adding the oxide. The great consumption of nickel now is not as metallic nickel, but they use it as an oxide or as a ferro-nickel for making steel rails,

armour plates, and all that sort of thing. There is no necessity for getting rid of the iron if you could give a ferro-nickel perfectly free from sulphur and free from copper. That is the problem before our Canadian metallurgists. It is to get rid of the sulphur and the copper and form ferro-nickel. Mr. Clergue has tried it and failed, as I told him he would, some years ago.

Mr. BROCK—Major Leckie has done good service in calling attention to this formation of nickel. The districts which may be prospected for this nickel are not confined to the Eastern part of Canada. As has been pointed out, there are similar nickel deposits in Oregon, and in British Columbia there are immense areas of this Serpentine. A great part of British Columbia as you know has not been carefully worked over geologically but in the Atlin district large areas of Serpentine are also known to occur and this pyrrhotite Serpentine is very similar to that in the eastern townships and in New Caledonia. It contains such minerals as Chromite and in parts of British Columbia, as in the Similkameen, it contains platinum. In some of the districts it is a brown material which resembles the ore of New Caledonia. It would be well for prospectors to bear in mind the possibility of nickel occurrences in these Serpentine. The basic rocks of the Sudbury District are closely allied in composition to this pyrrhotite, the difference being that they are not quite so basic. From some experiments on these rocks it is known that nickel does occur in small quantities in some of the basic minerals constituting these rocks.

The PRESIDENT—I was in hopes when Major Leckie described the superficial deposits in New Caledonia that we might hope to see an end to it before very long in order that our Canadian deposits would be more valuable. That is a selfish idea no doubt, but it is a very natural one. However when Major Leckie further said that the deposits were found 150 miles in length, I am afraid we will have something to tackle in trying to keep our end up. On the other hand I am very much consoled by Mr. Brock's view that we have not only these magnesian igneous rocks in the eastern townships but also in British Columbia, and all along our Pacific Coast, more or less.

The thanks of the meeting were accorded to Major Leckie.

#### PRIMITIVE MINING AND SMELTING IN INDIA.

Prof. T. L. WALKER of Toronto University delivered an address "On some Primitive Methods of Mining and Smelting in India (Illustrated by lantern projections)."

Prof. WALKER spoke from personal experiences in India and Ceylon and his photographs taken by himself on the spot portrayed the primitive methods of gold washing, iron smelting and mica mining. He pointed out how whole families were engaged in this labour and were paid at the rate of 2 cents a day each while the manager of a mine would get \$5.00 a month.

At the conclusion of the address, in reply to questions, he stated that in the mines represented by the Government of India there was a royalty of 10 per cent and in mines which belonged to the great native princes the mining was done as a matter of bargain. When the mica was shipped to England and sold, the bills of sale were returned and the royalty was collected on that. Prof. Walker also explained the geological formation in which the mica was found in India.

A cordial vote of thanks was tendered to Prof. Walker.

Mr. W. J. MILLER, Provincial Mineralogist, Toronto was on the syllabus for a paper on "Notes on the History of the Mineral Industry in the Nineteenth Century."

As the time was limited Prof. Miller gave but a brief summary of his paper and he illustrated, by diagrams, the production of minerals in different countries during the last two centuries.

The address of Professor Miller was most interesting and at its conclusion the President in tendering the thanks of the Institute to him, regretted that time did not permit to hear the paper read *in extenso* but that they all felt there would be much benefit derived from it when it was printed in the Journal of the Institute.

The meeting then adjourned.

#### ANNUAL DINNER.

The Annual Dinner in the evening was one of the most successful functions held by the Institute and was largely attended.

Velvet Rossland.—The manager cables:—"Have received the following returns from smelters, namely:—226 tons first-class ore yielded 205 ozs. gold, 19,100 lbs. copper. Net returns from smelters \$4,370, or an average of £4 per ton."



## LE ROI.

### Manager Mackenzie Gives Some Valuable Information to the Shareholders showing the Position and Prospects of the Mine.

At the annual meeting of the Lé Roi Mining Company held in London 30th January last, some interesting information was presented to the shareholders. During the months since the end of the financial year, viz.: from July 1st to December 31st, 1902, the returns furnished by the General Manager show that the profits during that period amounted to about \$450,000. Considerable interest will be taken in Mr. Mackenzie's report, which we reproduce in full as follows:—

"Your Company's mineral claims at Rossland, British Columbia, consist of the Le Roi, Black Bear, Le Roi Star, Pearl and Ruby, containing in all 71.44 acres.

Within the area above-mentioned are three important veins known as the "North," "South" and "Middle" respectively.

**Middle Vein.**—This is the main vein, and upon it is located both the old and the new shafts, the latter being the main working shaft through which all mining operations are carried on, the North and South veins being reached by cross-cuts. The Combination Shaft has reached a depth of 1,284½ ft., and extensive exploration work is being carried on in the 9th, 1,050 and 12th levels. As the work on the latter level has only just begun it is impossible to predict whether or not valuable discoveries of ore will be made at this point. On the 1,050 level, at about 125 ft. east from the Main Shaft, a body of ore of fair shipping grade has been developed, the shoot being 62 ft. long, with an average width of 10 ft. Between the 9th and 1,050 levels, west of the Main Shaft, a body of high-grade ore is being opened up by a winze from the 900. This winze is down 75 ft. below the 900, and is in ore the whole distance which will average \$18 per ton. By judicious exploration work above the 7th level, I believe a considerable tonnage of high-grade ore can be developed between, and adjoining, the stopes now being worked. In the haste to attain depth and explore the lower levels much virgin territory has been left between the Tregear Shoot on the extreme western limits of the known ore body and the Miller Shoot which adjoins the Centre Star Mine on the eastern boundary.

**South Vein.**—This has been developed by cross cuts at the 5th and 7th levels, and a large tonnage of ore is blocked out that will realize a profit when operating expenses are reduced to \$9 per ton, or the value of copper rises to 15 cents per pound. A raise on this vein from the 7th to the 5th level proves that the ore body is continuous between them, and contains average values of \$8 per ton—proper sorting will bring the shipping grade up to \$10 per ton.

**North Vein.**—The outcrop of this vein at the western end is very promising, and should be further prospected to determine its value. Although it is small it carries high values in gold and copper. The vein is intersected by cross-cuts on the 4th, 7th and 9th levels, but no exploration work has been done under where the outcrop is most promising.

#### ORE RESERVES.

Mr. R. J. Frecheville, M.E., in his report to the Directors and Shareholders of your Company, dated December 4th, 1901, estimated the ore reserves of shipping grade at that time as 483,872 tons, valued at \$11.75— the basis of values being: Gold at \$20 per ounce, silver 60 cents per ounce, and copper 16½ cents per pound. The present prices of these metals are: Gold \$20 per ounce, silver 53 cents per ounce, and copper 11½ cents per pound, which reduces the value of these reserves to \$10.37 per ton. From the date of Mr. Frecheville's report an additional tonnage, amounting to 93,121, of an average value of \$10.26, has been developed. The extraction during the same period was 129,635½ tons, containing gross values of \$1,517,064.66, equal to \$11.70 per ton. By making due allowance for the fact that the grade of ore extracted was higher than the average of the mine, I estimate the reserves at the close of the fiscal year at 447,358 tons of an average of \$9.96 based on the present values of metals.

A survey of the second-class dump shows that it contains 84,000 tons of ore, and several carloads taken as a sample indicate a value of \$7.50 per ton. A small dump adjacent to the old shaft contains 3,000 tons of ore, which, judging from the returns of a quantity already shipped, carries values equal to \$12.50 per ton.

#### ORE PRODUCTION, ETC.

The ore mined and shipped to Northport during the year amounted to 155,765.407 dry tons, its metal values averaging: Gold .373 ounces, silver .709 ounces and copper 1.526 per cent. per ton. The gross value of this ore was \$1,821,773.05, equal to \$11.695 per ton. The location and area of the ore extracted is shown by heavy black contour lines on the vertical projection of the workings which accompanies this report.

The mining operations embrace only a period of 263 days, as during the months of July, August and September practically no work was carried on owing to the "strike" existing at your mine and smelter.

There were shipped to the smelters at Trail and Northport, during the year, 14,333.101 dry tons of second-class dump ore, which contained average metal values of: Gold .377 oz., silver .485 oz., and copper 827 per cent. per ton. The gross value amounted to \$147,517.36, equal to 10.29 per ton.

Assuming that the average value of the ore mined during the year was \$11.695 per ton, and deducting the operating expenses for the same period, \$10.652 per ton, a profit of \$1.043 is shown to have been made on the first-class ore, equal to \$162,460.00. The gross value of the second-class dump ore treated during the year was \$10.29 per ton, the total expenses incurred in connection with same was \$5.35 per ton, leaving a profit of \$4.94 per ton, equal to \$70,830.00. The total profits, therefore, amounted to \$233,290.00.

#### WORKING COSTS.

Messrs. Price, Waterhouse & Co., your auditors, in their report, gave our total operating expenses, which embraced mining, freighting of ore, smelting and realization of matte values, for the year ending June 30th, 1901, as \$10.724 per ton. Apparently, they failed to make any allowance for the regular metal losses in slag, as is shown by the subjoined table, which gives the comparative costs under this head for the years 1901 and 1902:—

|                                                                | Per Ton.<br>1901 | Per Ton.<br>1902 |
|----------------------------------------------------------------|------------------|------------------|
| Stopping and loading on railroad.....                          | \$3.487          | \$3.100          |
| Exploration.....                                               | .423             | .451             |
| Depreciation:—                                                 |                  |                  |
| Mine equipment.....                                            | .080             | .138             |
| Surface improvements.....                                      | .050             | .061             |
| Mine machinery.....                                            | .106             | .125             |
| Freight on ore to smelter.....                                 | .510             | .400             |
| Smelter expense.....                                           | 4.465            | 4.205            |
| Depreciation of smelter plant.....                             | .232             | .119             |
| Interest and discount on ore in yard and matte in transit..... | .229             | .233             |
| Freight on matte to refiners.....                              | .536             | .404             |
| Sacking and crushing matte.....                                | .044             | .043             |
| Eastern representation, assaying, &c.....                      | .028             | .013             |
| Refiners' tolls and deductions.....                            | .534             | .579             |
| Metal losses in smelting.....                                  | .....            | .781             |
|                                                                | \$10.724         | \$10.652         |

Although nearly \$53,000 of the exploration costs carried forward in Capital Account from the years 1900 and 1901, have been charged to the present year's cost, and an extremely liberal allowance made for the depreciation of the development performed in 1902, the cost of mining and smelting was reduced 74 cents per ton, in spite of the fact that the tonnage mined was nearly one-fourth less than that treated during the previous year. The metal losses in slag, however, which were not taken into consideration in that period, more than offsets this saving.

The working costs of the year do not provide a correct index of what can be done in the future, as I believe that under reasonably favorable conditions the costs can be cut down to \$9 per ton. We have been heavily handicapped by labour troubles, besides high freight rates and fuel costs, which I have every reason to believe will be reduced in the near future.

#### REVIEW OF MINE EXPENDITURES.

During the year the gross expenditures for operating and equipping the mine amounted to \$593,896.93.

The amount expended on Revenue Account segregated as below was... \$487,009 77

|                               |              |
|-------------------------------|--------------|
| Stopping ore from mine.....   | \$482,500 60 |
| Loading second-class ore..... | 4,509 17     |

The amount expended on Capital Account segregated as below was... 106,887 16

|                                           |             |
|-------------------------------------------|-------------|
| Mine machinery and plant.....             | \$ 6,453 74 |
| Surface improvements and buildings.....   | 6,477 75    |
| Furniture.....                            | 2,205 84    |
| Surveyors' and assayers' instruments..... | 949 55      |
| Mine equipment.....                       | 6,763 93    |
| Exploration and development.....          | 84,036 35   |

The sum charged to "Profit and Loss," distributed as follows, was... \$605,131 78

|                                         |              |
|-----------------------------------------|--------------|
| Stopping ore from mine.....             | \$482,500 60 |
| Depreciation:—                          |              |
| Exploration and development.....        | 71,998 20    |
| Mine equipment.....                     | 21,558 88    |
| Machinery and plant.....                | 19,483 22    |
| Surface improvements and buildings..... | 9,590 88     |

During the year the sum of \$84,036.35 was expended in the development of the mine. The details of the work accomplished, and costs, are as follows:—

| WORK.                 | FOOTAGE.  | TOTAL COST. | COST PER FT. |
|-----------------------|-----------|-------------|--------------|
| Sinking shaft.....    | 167½      | \$17,920 59 | \$106 99     |
| Station cutting.....  | .....     | 2,396 17    | .....        |
| Pocket cutting.....   | .....     | 6,182 93    | .....        |
| Winzing.....          | 75        | 3,548 79    | 47 32        |
| Raising.....          | 591½      | 18,803 54   | 31 79        |
| Cross-cutting.....    | 420       | 7,947 73    | 18 92        |
| Driving.....          | 1,495     | 25,343 92   | 16 95        |
| Diamond drilling..... | 374       | 1,892 68    | .....        |
| Total.....            | 3,123 ft. | \$84,036 35 |              |

The accompanying plan shows the above workings wherever possible. They can be distinguished by heavy contour lines.

#### THE NORTHPORT SMELTING WORKS.

These works are situated at Northport, Washington, and are owned by your Company. They are distant about 17 miles from the Le Roi mine, with which they are connected by the Spokane Falls and Northern Railway, a branch of the Great Northern System. The location is considered to be an excellent one, as the smelter is always assured of an unlimited quantity of lime rock, particularly well suited for fluxing purposes, at a nominal cost; and a constant and adequate supply of water for the general uses of the plant as well as for carrying off the slag. The transportation facilities of Northport are already good, but an additional advantage will be gained during the present year, as the branch line of the Great Northern Railway which is to be connected with the Crow's Nest Pass coal field will shortly be completed and the smelter enabled to obtain ample supplies of first-class coke at a reasonable rate. If good business judgment and economy is exercised, there is no reason why much profit should not accrue to the Company from the treatment of custom ore, as with the many points in our favor we should eventually be in a position to secure much of the ore produced in Washington, Montana, Idaho, Oregon and British Columbia.

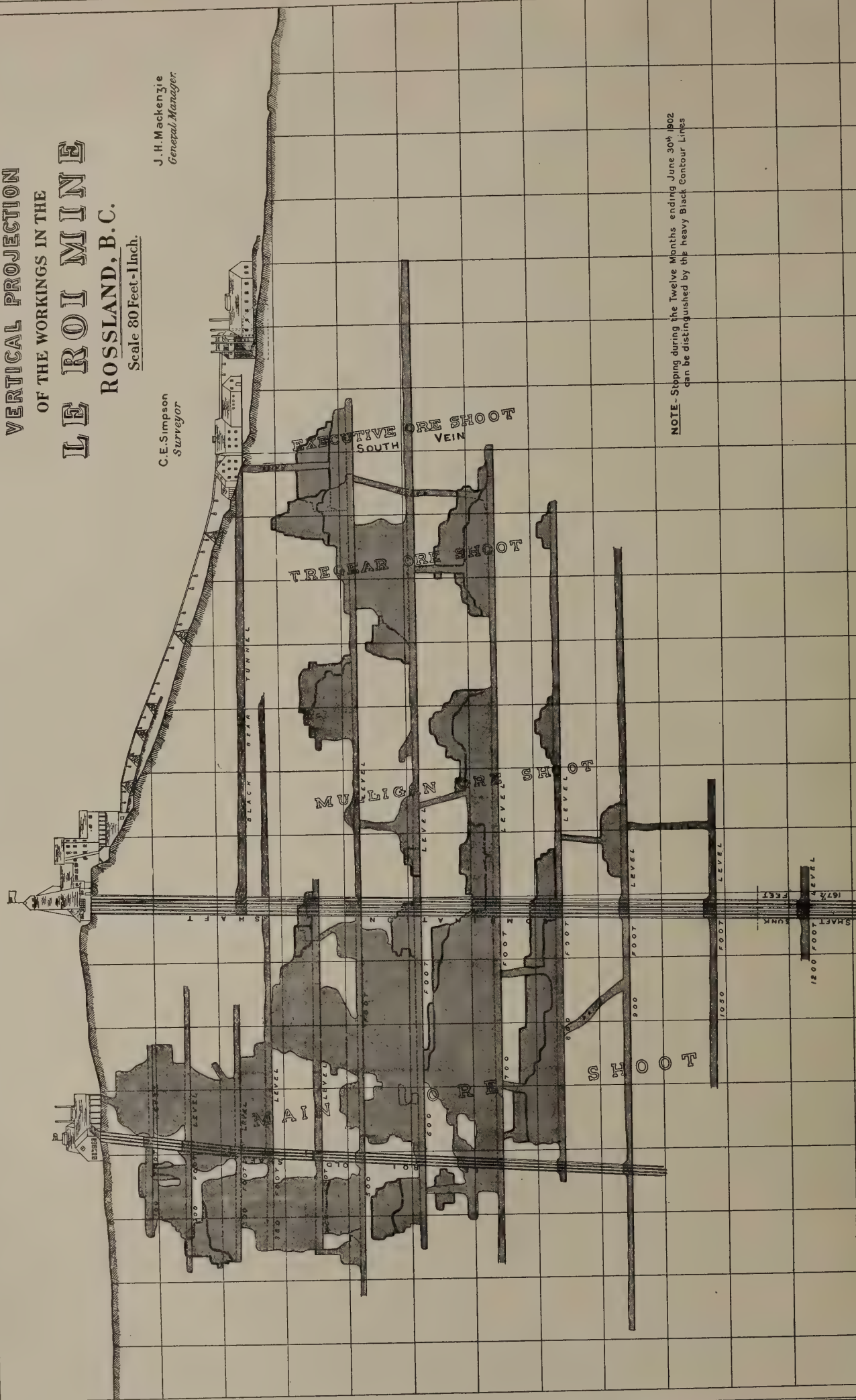
The full capacity of the plant provides for the treatment of 1,200 to 1,500 tons of ore daily. It consists of six large water-jacket copper matting furnaces, one of which has but recently been erected, three calcining furnaces, rug mills, briquetting machines, etc. The ore is taken from the roast yards to the bins at the back of the furnaces by means of a small locomotive, and the tracks are loaded at the heaps by a steam shovel. The various mechanical appliances are in first-class condition.



VERTICAL PROJECTION  
OF THE WORKINGS IN THE  
**LE ROI MINE**  
ROSSLAND, B. C.  
Scale 80 Feet-1 Inch.

J. H. Mackenzie  
General Manager.

C. E. Simpson  
Surveyor



NOTE- Stopping during the Twelve Months ending June 30th 1902  
can be distinguished by the heavy Black Contour Lines



## SMELTER EXPENDITURE.

The "labour trouble" which has been referred to before in this report, besides retarding the operations of the smelter very materially, did much, both directly and indirectly, to increase the working costs of the year under review.

The total working expense for the year, segregated as follows, amounted to—

|                     |                |                |
|---------------------|----------------|----------------|
| Smelting ores ..... | \$1,117,668 62 | \$1,194,567 67 |
| Matte charges ..... | 76,899 05      |                |

The total expenditure on Capital Account, made up as follows, was—

|                                        |             |            |
|----------------------------------------|-------------|------------|
| New buildings .....                    | \$35,948 74 | 122,281 60 |
| Bins, trestles, and roast yard .....   | 1,055 65    |            |
| Water and fire protection system ..... | 14,240 89   |            |
| Machinery .....                        | 43,786 54   |            |
| Tramways and equipment .....           | 17,722 63   |            |
| Sewage system, etc. ....               | 4,527 15    |            |
| Purchase of 95 acres of land .....     | 5,000 00    |            |

## GENERAL REMARKS.

The matte shipped during the year was 6,779.067 tons of a nett value of \$2,532,302.67, equal to \$373.55 per ton. The ores smelted amounted to 265,761.078 tons, of which 56,073.695 tons were purchased. No profit accrues to your Company as a result of the treatment of the latter, owing to the fact that they were almost invariably bought on a falling market, and usually on a metallic basis of settlement which left a scant margin in favor of the smelter. It is merely necessary to state by way of illustration that your Company's contract with the Le Roi No. 2, Limited, and Rossland Great Western Mines, Limited, provides for the purchase of their ores on a basis of 98 per cent. of the copper extraction, while the actual recovery is much less; and virtually immediate payment at market quotations, while your Company's settlement with the refiners, fully 100 days later, has usually been on a lower basis of value.

The Company's holdings in the name of the Northport Smelting and Refining Company, Limited, besides the smelter and the ground upon which it is situated, comprise a half interest in the Northport water system; 95 acres of land adjoining the Northport town site, which cost \$5,000; an undivided fourth interest in the platted Northport town site; a quarry which contains the limestone which is being drawn upon by the smelter; and a group of mining claims, known as the "La Fleur Comstock," situated near Republic, Ferry County, Washington. These claims were purchased three years ago for \$49,500, but as they are practically undeveloped I can place no value upon them.

## CONCLUSION.

This report would be incomplete unless some reference were made to the financial condition of the Company, which has recently been the subject of much comment, and exercised such a powerful influence over the price of its shares. While the Le Roi Mining Company, Limited, commenced the fiscal year of 1902 with an apparent surplus of assets in its favor, and made a profit of \$233,290.00 during the nine months in which its mining operations were conducted, our books show that a deficit in assets existed at the close of the year. This paradoxical state of affairs is attributable to four causes, which are:—

1. Over-estimate of the value of the stock of metals on hand at the smelter on June 30th, 1901.
2. Failure to allow for losses of copper and silver in slag in estimating profits made prior to June 30th, 1901.
3. Fall in the price of metals which has taken place during the year ending June 30th, 1902.
4. Heavy expenditure made on capital account during the year.

As I have already submitted a lengthy report touching the over-estimate of the stock on hand and slag losses (see my letter dated May 6th, 1902, addressed to H. J. Hill, Esq., formerly Chairman of the Board), it is merely necessary to state that our assets sustained a reduction of approximately \$300,000 under these two heads.

The fall in the price of metals has reduced the estimates which have been made concerning our profits very greatly, possibly to the extent of \$80,000—the exact figures are impossible to ascertain. To make this statement clear, I should explain that by reason of the fact that the actual market value of our ores cannot be learned until they reach the hands of the refiners in the shape of matte it is impossible to estimate our profits over a given period with any degree of accuracy. For the purpose of the monthly reports which are transmitted to the London office, and for the settlements made between the mine and smelter, the practice has been followed of placing a value on the monthly outputs on the metallic basis prevailing during the month in which the ore is mined. This procedure, apparently the only one which could be pursued under the circumstances, operates satisfactorily when copper and silver prices remain comparatively steady; but when fluctuations, such as have taken place several times during the past year, occur, profits are metamorphosed into actual losses. According to the showing made by our ore books, the profit of \$233,290 previously referred to has been made on the first-class ore mined and the second-class ore treated, basing our estimates in the manner indicated, when, as a matter of fact, the matte settlements, made about three months after the receipt of the ore at the smelter, at the market prices then prevailing were approximately \$50,000 less. An additional sum of \$30,000 may be said to have been lost on the sales of "Custom" ores owing to the fall in prices.

The capital expenditures on the Company's smelter shows that over \$117,000 have been spent during the year in various ways. The installation of blast furnace No. 6, completion of the calcine furnace, &c., the purchase of the steam shovel, additional boilers and sampling mill machinery, &c., are responsible for nearly one-half of this sum, while the balance was expended in the purchase and installation of pumps, &c., used in connection with the water and fire protection system, buildings erected at the time of the strike for the accommodation of the employees, installation of a sewage system, &c., and in connection with the electrical machinery for the tramway. The money expended at the Mine on machinery and plant and surface improvements was comparatively small, amounting to less than \$13,000. Half of the amount was spent in the construction of a flume and in making additional improvements in connection with our water and fire protection system, whilst the remainder of the sum was expended in the erection of or additions to buildings and in the purchase of additional machinery.

**B. C. Exploring Syndicate.**—The Directors have resolved to raise debentures to the extent of one-fourth of the issued capital of the Company. These debentures will be of the nominal value of £10 each, bearing interest at the rate of 6 per cent. per annum, with a bonus of 20 per cent. in shares of the Syndicate on redemption.

## LE ROI II.

The following is excerpted from the Directors Report, submitted on the 3rd ultimo.

The Directors herewith submit the audited accounts of the company for the year ending 30th September, 1902, showing a balance to the Credit of Profit and Loss Account of £44,986 19s. 8d., out of which an interim dividend of 5 per cent. has been paid.

The shareholders will see that the total output during the financial year was 63,261 tons, of a gross value of \$1,068,915.78.

The heavy fall in the price of copper and silver during the last nine months of the financial year decreased by \$121,182 what would otherwise have been the nett earnings of the Company had the price of the previous year been maintained.

Cost of mining amounted to \$3,702 per ton.

The smelting charges to which the Company was bound for two years by an agreement made by Mr. MacDonald with the Northport Smelter, on the 16th of August, 1901, amounted approximately to \$8 per ton.

The Directors took Counsel's opinion as to the possibility of nullifying this agreement on the ground that it was signed by Mr. McDonald for both sides, under a very limited Power of Attorney, but were advised that there were small chances of success.

The largest profit was shown in the month of April, after which there was a steady decrease in the value of the output and a corresponding decrease in profit.

On September 21st, the manager cabled recommending the reduction of the output to 3,500 tons per month, which, in view of the smelting position, the Board thoroughly approved of, expressing at the same time a hope that the grade of ore would be correspondingly increased.

During the months of September and October it would appear that the mine was actually being worked at a loss. As soon as the Board ascertained this they prohibited the output of any ore under \$17, as it was evident that the mine was simply being denuded of ore which it was believed, under improved methods of treatment, can be made to yield a material profit.

According to Mr. McDonald's statement of high grade ore in sight, dated June 21st, and circulated among the shareholders, there should have been no difficulty in continuing the output of \$17 ore.

On 28th October the manager recommended the cessation of shipments till better rates for treatment could be secured, to which the directors assented.

At the expiry of the agreement with Messrs. McDonald & Thompson, the Board handed over the management of the mine to Mr. Alexander Hill, who himself installed his representative, Mr. Couldry, in office. In taking this step the Board feel that they have placed the mine under the most capable control procurable, and have also insured that information received by the Board will be in accordance with fact.

The new manager will not at present commit himself to any figures as to tonnage and values in sight in the mine, as it is impossible to estimate these with any degree of certainty where ore bodies are so irregular.

There is, however, beyond question a very large body of low grade ore which it is anticipated can be profitably worked by concentration, and interspersed with it an appreciable quantity of high grade ore. It will no doubt, be found best to ship ore above a certain grade direct to the smelter even when the concentration plant is in operation.

In connection with concentration a number of experiments have been recently made in London as to the suitability of the Elmore Oil process to Le Roi No. 2 low grade ores, and the result has been such as to warrant the directors in giving instructions for the erection of an experimental plant of two units, capable of dealing with 50 tons a day, in the neighborhood of the mine. Should this prove successful the intention is to increase the plant to such a capacity as can deal with the entire output of the mine.

The effect of the process, roughly speaking, is to concentrate the mineral contents of ores which are of two low a grade to show a profit on smelting charges.

Thus on six tons of crude ore producing say one ton of concentrates, the smelting charge (according to the present rates) would be \$8 instead of \$48. There is no doubt, however, that better terms than the present can be made for the smelting of concentrates, as these are a desirable acquisition to any smelter.

By the new process, too, the cost of mining will be considerably reduced, as the necessity for hand picking and sorting will no longer exist, all ore going through just as it comes out from the mine.

A certain amount of high grade ore is at present being shipped to the Northport Smelter, but till, by the new arrangement, the straightforward stoping of all ore (high and low grade) becomes practicable, much of the high grade ore in the mine would be too expensive to handle."

## COMPANY NOTES.

**Mond Nickel Company.**—In their report to the shareholders for the year ended 30th April, 1902, submitted in July: "The Directors are pleased to be able to report the satisfactory progress of the Company's business, both in Canada and in England. Mining and smelting in Canada has been carried on continuously since last July, and the refining works at Clydach, are now in operation. The directors wish to draw attention to the item in the Balance Sheet, "Ore on Roast Yards and Products in Stock, £82,725 18s. 11d.," the main portion of which is represented by high grade nickel and copper matte in stock and in transit, which has been produced at our smelting works. The whole of this stock has been valued at cost price (including general expenses from the incorporation of the Company to 30th April, 1902) which is much below its actual value. None of this matte, having up to the date of the balance sheet, been converted at the refining works into its ultimate products, viz., copper sulphate and refined nickel. The directors have preferred not to open a Profit and Loss Account."

**Anglo-Klondyke Mining Co.**—The following is extracted from the Directors report submitted on the 17th December last: "From the amount of available net profit, viz., £28,467 17s. 2d., the directors recommend the declaration of a dividend of 20 per cent. on the ordinary shares. This will absorb £24,659 12s., leaving a balance to be carried forward of £3,808 5s. 2d."

**Mikado Gold Mining Co.**—The last issued report of the Directors (submitted in London on 11th November last) shows a debit balance of £5,052 4s. 6d., nearly the whole of which represents allowances made for depreciation on "mine development account," and ore exhausted during the year. The position of the Company at 30th September was roughly:—



Amount required to meet liabilities in Canada to 30th September, 1902, and to provide working expenses to end of March, 1903, according to manager's estimate, say..... £5,400  
Total liabilities in London..... 1,650

£7,050  
Less calls collectable, say..... £3,320

Showing a deficit of, say..... £3,730

**Canadian Smelting Works.**—The ore tonnage for 1902 at the Trail Smelting Plant was as follows:

45,000 tons in the copper furnaces.  
30,000 tons in the lead furnaces.  
75,000 tons ore smelted.

There was produced from the above 1,050 tons of copper matte containing gold, 18,219 ozs; silver, 94,300 ozs; copper, 1,101,837 lbs. The lead bullion produced was about 4,200 tons containing:

Gold..... 12,431 ozs.  
Silver..... 1,123,779 ozs.  
Lead..... 8,314,313 lbs.

There were 876 tons of refined lead produced at the Trail refinery, all of which were sold on the Canadian market.

**Lillooet Fraser River and Cariboo Gold Fields.**—The liquidators have issued a report to the shareholders under date of 10th January, from which we quote: "As will be seen from the accounts the ascertained liabilities of the Company amounted to £456 4s. 1d., but it is possible that claims for outstanding taxes on the various properties in British Columbia will come in later. These may amount altogether to £100 to £150. After providing for these liabilities and the expenses of the liquidators in London and in British Columbia the whole of the assets of the Company will be available for distribution among the shareholders."

**Morrison Mines.**—At the annual general meeting held on 20th December, the following were elected directors for the ensuing year: John Hunner, President; F. R. Fisk, Vice-President; A. F. Oliver, Secretary-Treasurer; F. C. Loring and E. K. Erwin. The following is taken from the balance sheet: Capital, \$15,000; assessment account, \$51,928.04; boarding house, \$993.11; ore account, \$75.43; bond account, \$5,000; George P. Crane, \$191.30. On the other side the entries show: Assessment Record, \$2.37; interest, \$359.05; property account, \$151,238.02; development, \$26,400.31; supplies, \$3,837.60; general expenses, \$5,163.34; office expenses, \$3,899.90; fuel, \$1,617.00; powder, \$3,111.83; assaying, \$341.50; hauling, \$432.27; permanent improvements, \$4,399.73; legal, \$858.90; freight, \$76.22; Little Buffalo Claim, \$6,000; office furniture and fixtures, \$299.50; cash on hand, \$150.34.

**The British Columbia Copper Co., Ltd.**—The Directors report for 1903, states: "In transmitting to you the report of the auditor showing the financial condition of this Company at the close of business in November 30th last, the Directors have to advise that you have a mine developed by over a mile of workings and to a depth of only about 500 feet, which, in the opinion of the Company's engineer, discloses over 3,000,000 tons of ore. This ore carries copper, gold and silver, the two latter being in nearly sufficient values to pay the cost of smelting. It can be cheaply mined and delivered to the Company's smelting plant and can there be made into a copper matte as cheap or cheaper than at any other reduction works in the country.

The Company's smelting plant consists of two blast furnaces 42 x 150 with adequate power and equipment, with a daily capacity of about 800 tons. At the mine there are the necessary hoisting machinery, air compressors and ore crushers.

We need immediately a converter plant, in order that our shipments shall be a 98 per cent. blister copper instead of a 45 per cent. matte. The savings to be effected by the installation of this plant will alone make a good dividend on the Company's capital.

In the judgment of the Board, the blast furnace capacity should be increased as soon as possible to 2,000 tons per day.

We have reason to suppose that we shall have additional railway facilities during the coming summer by the completion of the Great Northern Railway into our property.

The Board has deemed it wise in the present condition of the Company's affairs to charge off as against mining property, mine and smelter buildings, etc., all the profits of the Company, and you will note that the same has been done on the accompanying statement."

**Colonial Copper Co.**—Mr. J. A. Hanway, President in his report to the shareholders under date of 3rd ulto., says: "I might say, before entering into the details, that the work has been energetically pushed, and much has been accomplished during the past year, which has met with the universal approval of the directors and all the shareholders who have inspected the mines.

This work has been confined to three of the leads or lodes on the property, viz., No. 1, No. 2 (or Hanway Lode) and No. 3 (or Bennett Brook), and that during the year a large amount of development work has been done. About 2,000 feet have been driven in the various tunnels, drifts and cross-cuts. Work has been deferred on the other leads or veins until we have the three above mentioned fully developed, when it is the intention of the management to start work on the latter. Owing to the failure of the manufacturers to deliver some of the machinery ordered for the concentrating plant, we have been unable to get the mill in operation, but it will be only a short time until it is in operation, and the policy of the company is to steadily increase the treating capacity as the development of the mines progress, so as to have annually an increased output for many years to come. No. 1 Shaft, in depth 371 feet with over 1,000 feet of tunnel and drifts from same. Now sinking on the vein, rock very fine. No. 2 or Hanway Lode. Slope going south from surface 326 feet. Slope going north from surface on the vein 300 feet. More than 800 feet of tunnels and drifts in addition. No. 3 or Bennett Brook. Vertical shaft, in depth 180 feet with tunnels and drifts of over 300 feet.

During the past year a new power plant has been erected at No. 2 or Hanway Lode, well equipped with machinery, Rand Duplex Air Compressor, three large hoisting engines, boilers, etc. Also additional machinery at Nos. 1 and 3.

All machinery has been set and work done in a thorough and substantial manner, and arranged with the view of handling the ore at the minimum cost.

Nearly all the machinery has been installed in the ore crushing and concentrating plant.

The management is very desirous of getting the mill in operation and to produce copper at the earliest possible date, and no effort will be spared to this end.

During the past year a railroad has been built over 1 1/4 miles and is equipped with locomotive and ore cars for conveying the ore from the mines to the mill. The road is 36 gauge, 40 lb. rail and well built.

A number of additional houses have been erected for the miners. Another boarding house erected at No. 2, an assay office with drafting room above, a large addition to the Lodge at the Cove, and other necessary buildings.

Considering that it has only been about 2 1/2 years since work has started at Cape D'Or, we fail to see how even the most impatient can criticise the progress.

One must visit the mines to fully realize what a gigantic undertaking it is and the apparent great future the Company has.

The same effort and economic policy will be pursued, and by the time another annual meeting is held, we trust our treasurer will produce a statement of receipts from the product.

The financial condition of the Company is in the same good, sound and safe state as at the time of our last annual meeting. No debts have been contracted other than current accounts."

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

POGSON, PELOUBET & CO.

## PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pick lime). Terms and particulars on application.

F. E. LEUSHNER,

Room 12, James Bld., TORONTO, Toronto.

## A. LESCHEN & SONS ROPE CO.

SOLE MANUFACTURERS OF

Patent Flattened  
Strand Wire Rope



Trade Mark Registered

REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

## LESCHEN'S Aerial Wire Rope TRAMWAYS

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

BRANCHES: New York, Chicago, San Francisco.





GOODS SENT SUBJECT TO APPROVAL

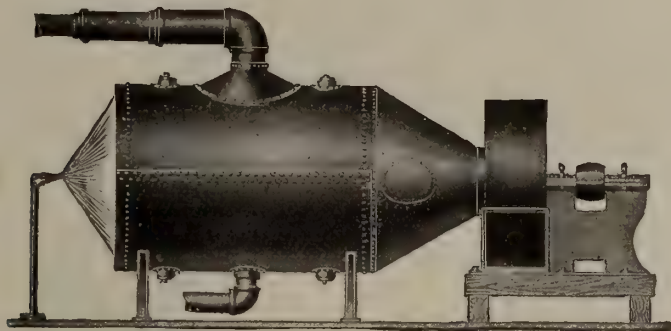
**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



THE COSMOPOLITAN CONDENSER

## A NEW WAY

### OF CONDENSING STEAM

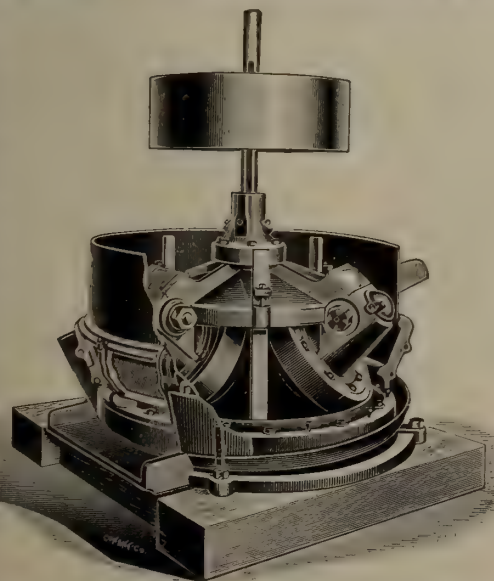
Descriptive Catalogue just off press—  
if interested, write us.

*Requires only one pound  
of water to condense an  
weight of steam.*

This is of prime im-  
portance in situations  
where water is scarce  
or expensive

## Laurie Engine Company

MONTREAL - - CANADA



## THE GRIFFIN THREE ROLLER ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.



# BRIQUETTING MACHINERY FOR SMELTERS AND BLAST FURNACES....

BRIQUETTE your Flue Dust, Fine Ores, Calcines, Concentrates, Slimes and other Mineral Fines

INCREASES THE CAPACITY OF THE FURNACE FROM 10 TO 25 PER CENT.

Our Improved WHITE MINERAL PRESS the only successful machine for the purpose.

Adopted by most all the Prominent Smelters in the United States.

Used by several Large Steel Works for briquetting Common Iron Flue Dust.

Sent on Trial and  
Satisfaction Guaranteed.

**CHISHOLM, BOYD & WHITE CO.**

CATALOGUE MAILED ON  
REQUEST

OFFICE AND WORKS: 5700 Wallace St.

CHICAGO, ILL., U. S. A.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

MONTREAL.

Obtain our Prices.

# MINE RAILS



## — THE — BLEICHERT WIRE ROPE TRAMWAY

More Bleichert Tramways in use  
than all others.

MANUFACTURED BY

### THE TRENTON IRON CO.

TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.  
Also, Wire Rope Equipments for Cable Hoist-Conveyors, Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining  
Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated  
Canadian Mining Institute.

Vols. I, II, III and IV Canadian  
Mining Institute.

**\$20** WILL be paid for a complete  
set of these volumes. Readers  
having any, or all, of these copies for  
sale please write to

**The Canadian Mining Review**

OTTAWA, Canada.



# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST  
MANUFACTURERS

MINERS SAFETY LAMPS

OF ALL  
KINDS

DAVIS'S PATENT ELECTRICALLY  
LIT LAMP TO BURN SPIRITS.



DAVIS'S "A1" DEPUTY'S FIREBOSS  
AND SHOT-FIRER'S LAMP.  
DAVIS'S "A1" DEPUTY in Aluminium is used ex-  
tensively by the largest coal mining companies in Great  
Britain and United States, and is universally acknow-  
ledged the best LAMP on the market.



DAVIS'S "A1" DEPUTY'S FIREBOSS  
AND SHOT-FIRER'S LAMP.

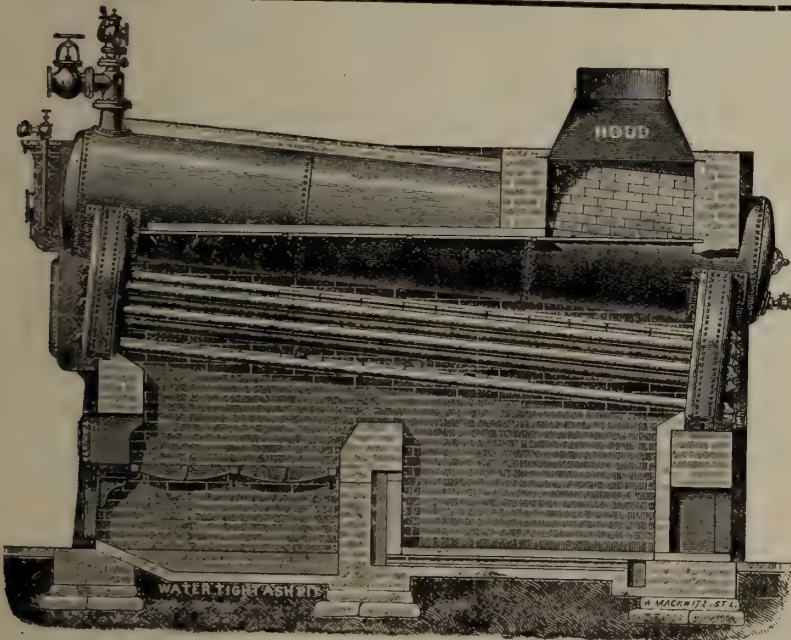
Stock at Montreal.

Sole Representative  
for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building  
MONTREAL.

Send for Catalogue and Prices.



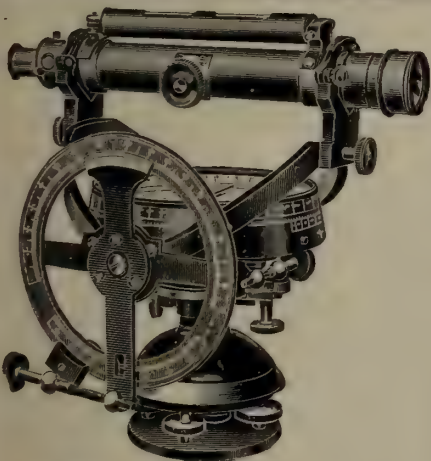
## HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co.

TORONTO, ONT.

THE HEINE SAFETY BOILER—Made in units  
of 100 to 500 h.p., and can be set in batteries of  
any number. Suitable for Mines, Pulp Mills, Water  
and Electric Installations, and large plants generally.  
The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine  
Staff, 6 feet, closing to  
20 inches, very port-  
able. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at  
the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

CREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890

## SPRINGHILL COAL.

The Cumberland Railway & Coal Company

Are prepared to deliver this well known  
Steam Coal at all points on the lines of  
G. T. R., C. P. R. and I. C. Railways.

Head Office: 107 ST. JAMES STREET, MONTREAL

Address: P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1. Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**  
Commissioner Public Works and Mines,  
HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and, upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

or

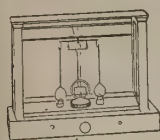
THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



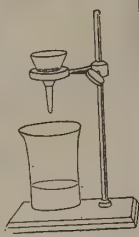
## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals

Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



**The Chemists & Surgeons Supply Co. Ltd.**

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.

**ASSAYERS and CHEMISTS  
SUPPLIES.**

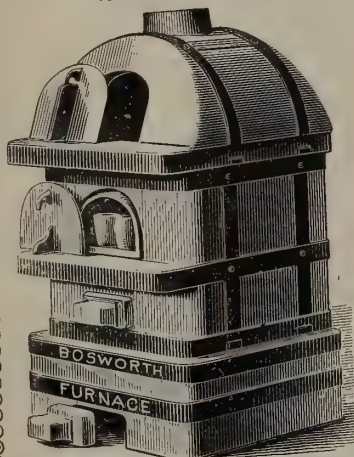
MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

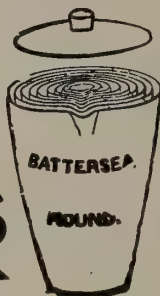
and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.



## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

**COMPLETE ASSAY OUTFITS.**

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

Munktel's Swedish Filters.

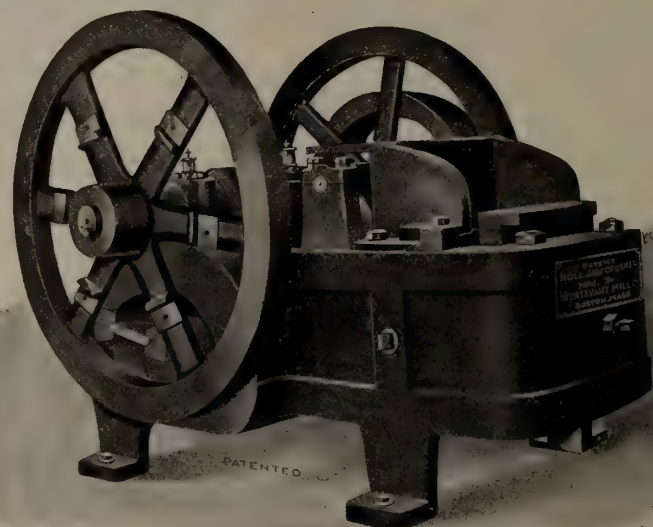
OUR 1897 CATALOGUE ON APPLICATION.

**Lyman, Sons & Company**

380, 382, 384 and 386 St. PAUL STREET

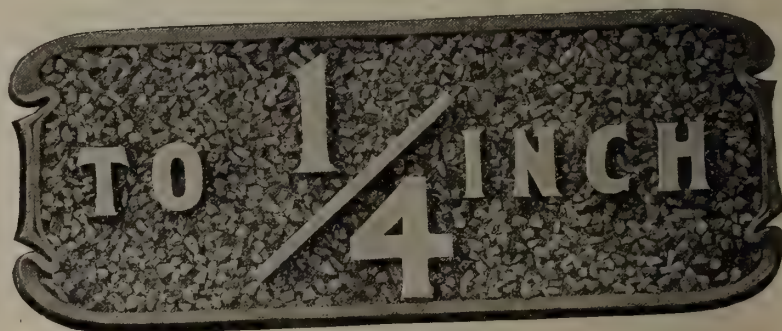
**MONTREAL.**

## ROLL JAW CRUSHER



Direct product actual size from a ROLL JAW CRUSHER without screens

**The only machines able to crush  
large, hard ore**



Do not clog

**Can also do coarse work**

Jaw Crushers work at 1-5 the cost of other machines;  
therefore crush fine, and increase capacity and save wear of your  
stamps, rolls and mills by feeding quarter and half-inch ores.  
Nothing pays better. Hundreds of Roll Jaw Crushers in use.  
Best references.

Send for catalogue "1903," of Crushing,  
Grinding and Screening Machinery.

**STURTEVANT MILL Co.**

BOSTON, MASS.

Stocks in Denver and Salt Lake City  
Also represented on the coast.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

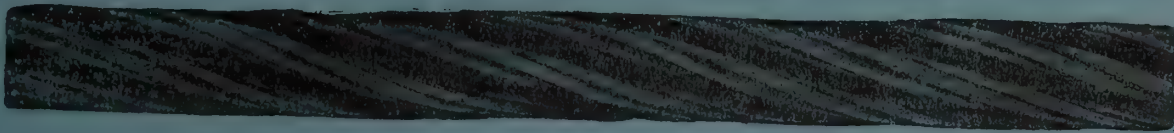


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA :

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

**IRON, STEEL and GENERAL METAL MERCHANTS**

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steal Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

**General Offices: CANADA LIFE BUILDING - MONTREAL.**

**Montreal Pipe Foundry Co.**

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

Canada Life Building - MONTREAL.

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES:

**CANADA LIFE BUILDING, MONTREAL.**

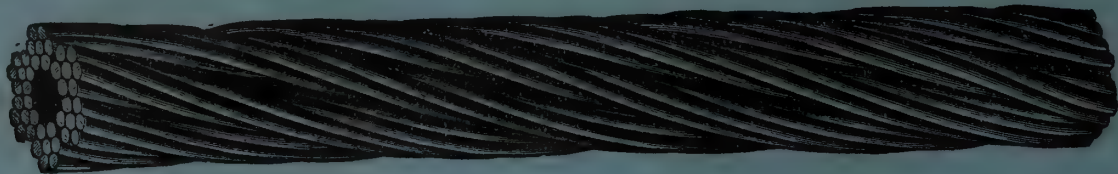
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.



ALSO

**SOMETHING  
NEW...**



**SOMETHING  
TO LAST...**

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

**UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES**

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard  
IMMEDIATE SHIPMENT.

LIGHT MINING RAILS  
12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
..IN STOCK..

ORE  
AND  
..Mining Cars..

WHEELBARROWS ALL KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

CATALOGUE  
ON  
APPLICATION

# JAMES COOPER

Office : 299 ST. JAMES ST., MONTREAL.



TWENTY-FIRST YEAR OF PUBLICATION

# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. VI.

OTTAWA, APRIL 30th, 1903.

Vol. XXII—No. IV.



**THE CANADIAN RAND DRILL CO.**  
SHERBROOKE, QUE.  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.





ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co

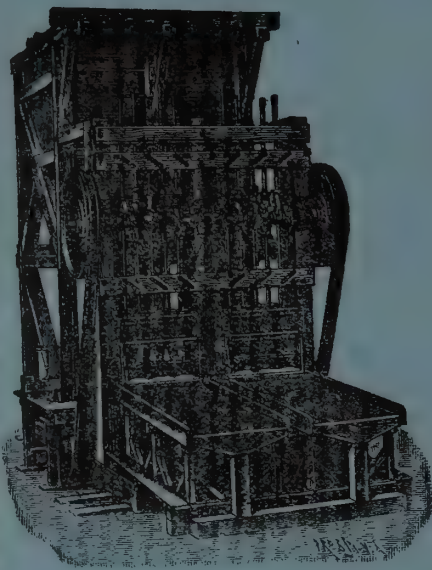
ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

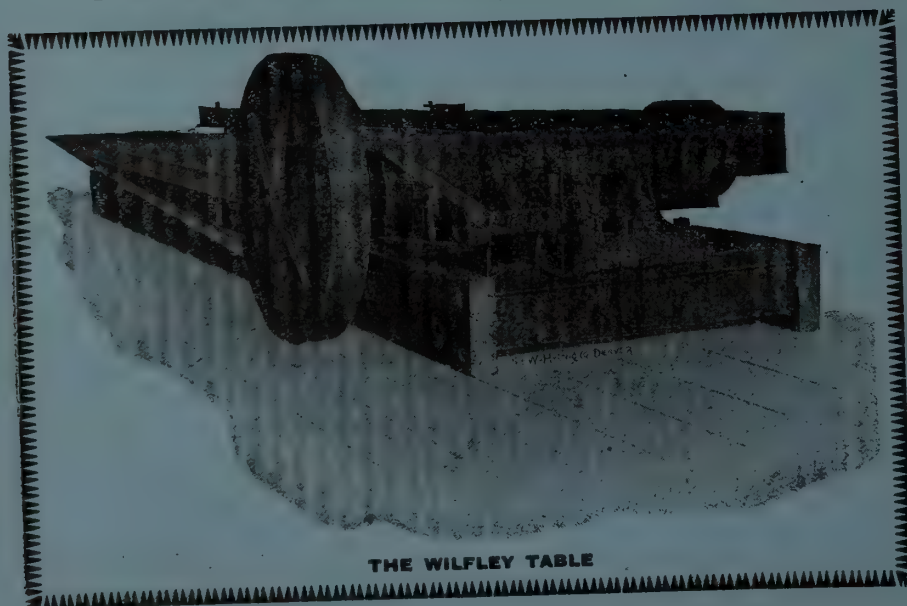
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

**ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.**

**THE CANDA PATENT SELF-LOCKING CAM**

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

**CHROME STEEL WORKS,**  
KENT AVENUE, KEAP  
AND HOOPER STREETS.  
BROOKLYN, N.Y., U.S.A.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

**THOS. FIRTH & SONS, Ltd., Sheffield,**  
**Tool Steel and Rock Drill Steel**

ALWAYS CARRIED IN STOCK.

**SHOES AND DIES.**

THOMAS FIRTH & SONS DRILL STEEL  
SHEFFIELD, ENGLAND

CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.

**H. W. DeCOURTENAY & CO.**

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

**THE LUNKENHEIMER SPECIALTIES**

Honestly made and always of good value; wherever exhibited invariably carry off the highest honors. Specify "Lunkenheimer" make and order from your dealer. Write for catalogue of Superior Brass and Iron Valves, Whistles, Injectors, Lubricators, Oil Pumps, Oil and Grease Cups, etc. All goods tested and inspected, and warranted to satisfy.

**THE LUNKENHEIMER CO.**  
CINCINNATI, OHIO, U. S. A.

Branches: New York: 26 Cortlandt Street.  
London: 35 Great Dover St., S. E.

Antwerp, 1894

Paris, 1900

Cincinnati, 1874-5

Buffalo, 1902

Omaha, 1898-9

Chicago, 1893

New Orleans, 1876

Selma, 1873

Philadelphia, 1876

**C. L. BERGER & SONS**

37 William Street  
**BOSTON, Mass.**

SUCCESSORS TO  
**BUFF & BERGER.**

**SPECIALTIES:**  
Standard Instruments  
and Appliances for  
**Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work**

SEND FOR CATALOGUE



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

BUILDER OF

## Mining Machinery

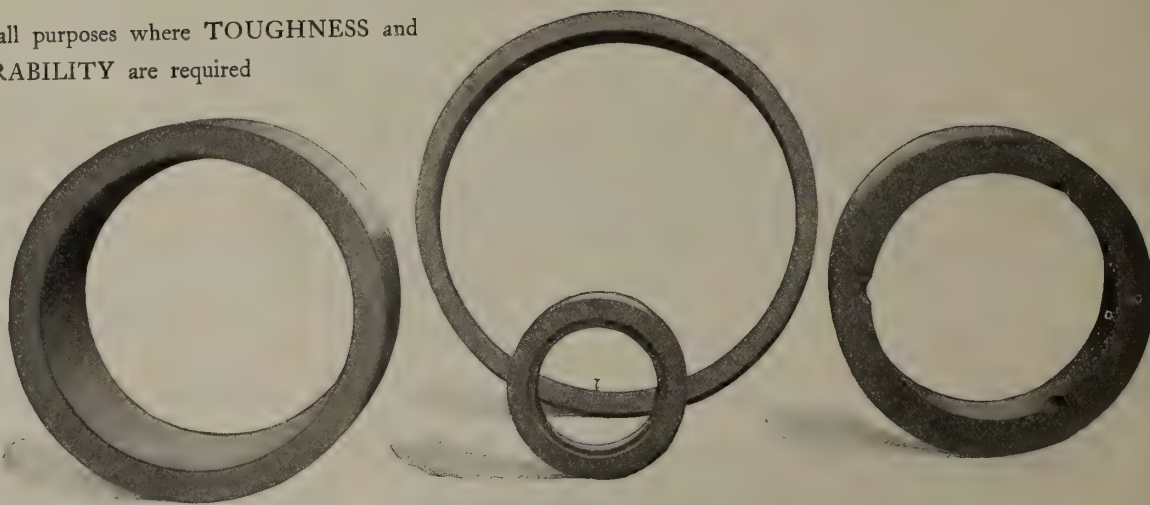
SOLE AND EXCLUSIVE AGENT FOR THE

Midvale Steel Co.'s  
"Perfected" Rolled Steel Product

KNOWN AS MIDVALE SPECIAL ANNEALED MIXTURE USED IN

### Roller Rings, Ring Dies and Roller Shells

For all purposes where TOUGHNESS and  
DURABILITY are required



The Midvale Steel Co.'s "SPECIAL ANNEALED MIXTURE" is acknowledged to possess greater *Toughness, Hardness and Wearing Qualities* than any other Steel Product on the market.

We carry a large stock of Roller Shells and Ring Dies for Huntington Mills and can make immediate shipment. :: :: :: Mining Machinery Repairs of every description solicited.

#### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, Dooly Block  
SPOKANE, Washington

#### GENERAL

CHICAGO,



#### OFFICE

ILL., U.S.A.

HOME INSURANCE BUILDING

#### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumbermen's Exch'ge Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
LONDON, ENG., 160 Dashwood House  
JOHANNESBURG, South Africa



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

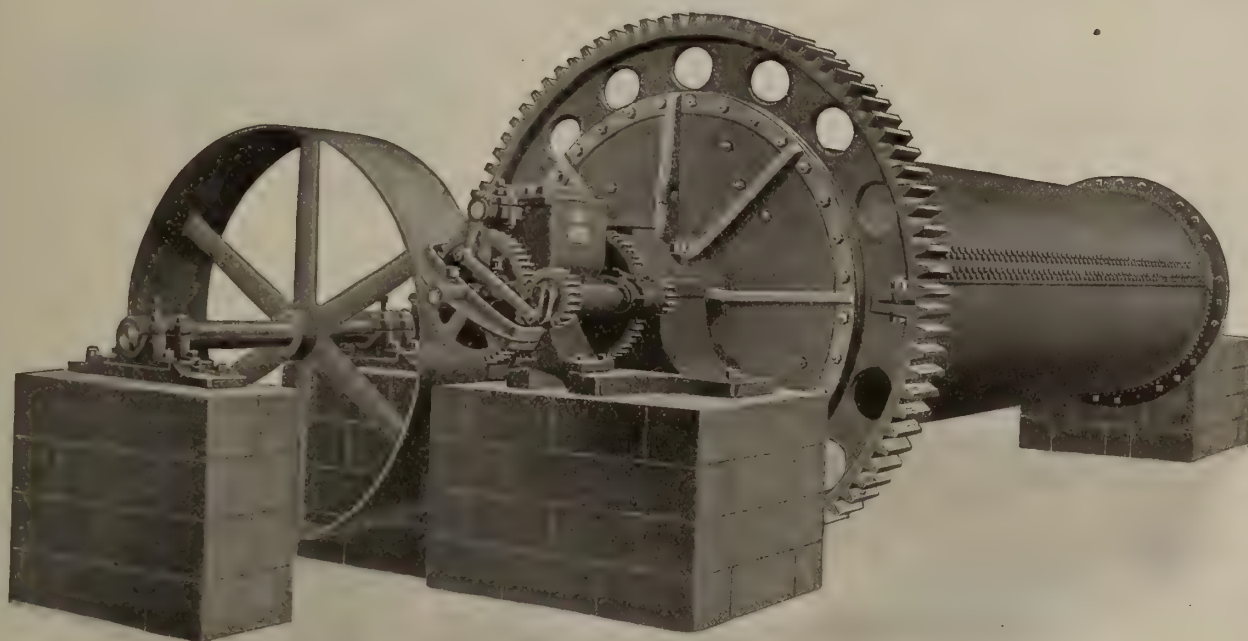
SUCCESSOR TO  
FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

MANUFACTURERS OF

## Mining Machinery



### GATES' TUBE MILL

This cut illustrates the highest type of all modern fine pulverizers, namely, the Gates Tube Mill. As a tube mill it is essentially a fine pulverizer and when used as such is effective and economical, giving large capacity at a very low cost for repairs. The Tube Mill consists of a plate steel shell, made to revolve by means of heavy gearing at about 25 revolutions per minute. The shell is about half filled with hard flint pebbles and material to be pulverized, and the constant rotation and wave-like tumbling action of the pebbles produces an enormous and flexible grinding surface. It is continuous in its operation, being equipped with the Gates Patent Automatic Adjustable Feeder and most approved form of dustless discharge. As the fineness of the discharged product depends upon the quantity of material fed, we have taken special pains to produce an automatic feeder, driven from the mill itself, capable of being adjusted to a nicety, which is not found in any other tube mill. In a modified form this same type of mill can be used for wet pulverizing, and we have furnished a number of the smaller sizes for regrinding jig tailings. We have patterns for and are prepared to manufacture mills 36, 42, 54 and 60 inches in diameter, and of any practicable length for the respective diameters.

#### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, Dooly Block  
SPOKANE, Washington

GENERAL OFFICE  
**CHICAGO, ILL., U.S.A.**  
HOME INSURANCE BUILDING



#### BRANCH OFFICES:

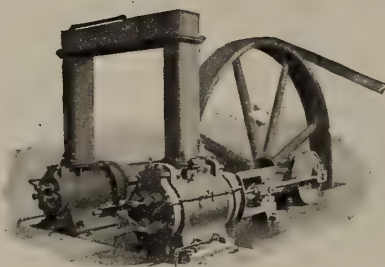
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumbermen's Exch'ge Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
LONDON, ENG., 160 Dashwood House  
JOHANNESBURG, South Africa



# THE CANADIAN RAND DRILL CO.



Class B-D Compressor  
[Air Cylinders next to Frame]



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Duplex (Meyer-Valve) Compressor



Straight Line Belt Driven Compressor



Cross-Compound Corliss Compressor

EASTERN BRANCHES  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

HEAD OFFICE & WORKS.  
**SHERBROOKE,**  
QUEBEC.

WESTERN BRANCHES  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.

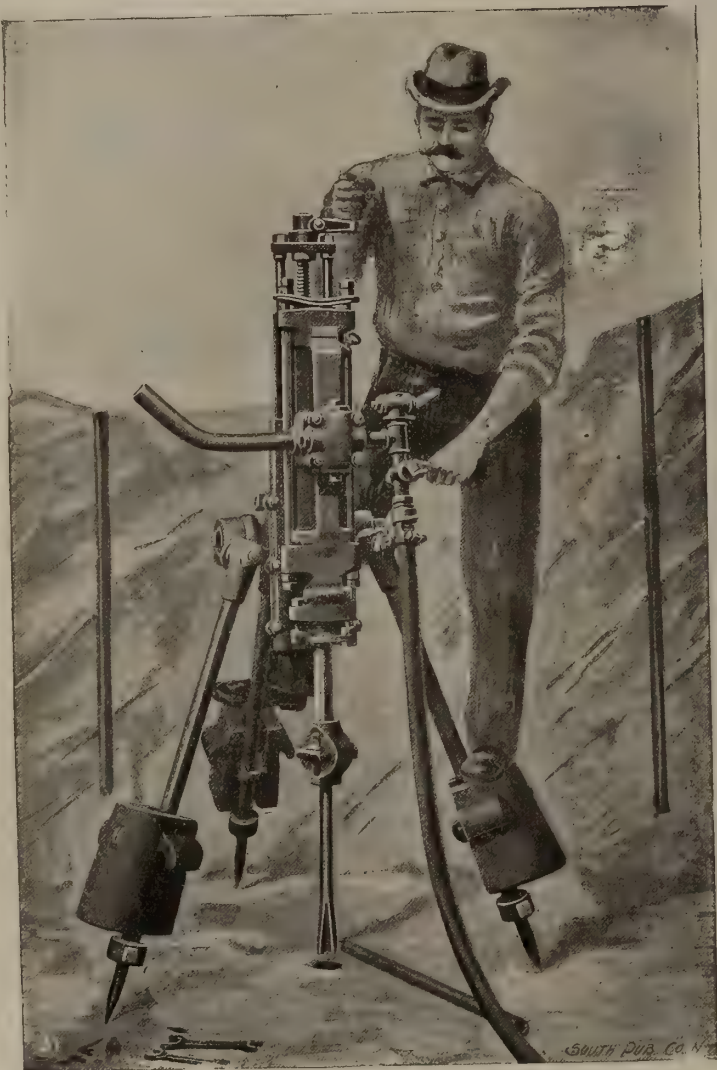


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

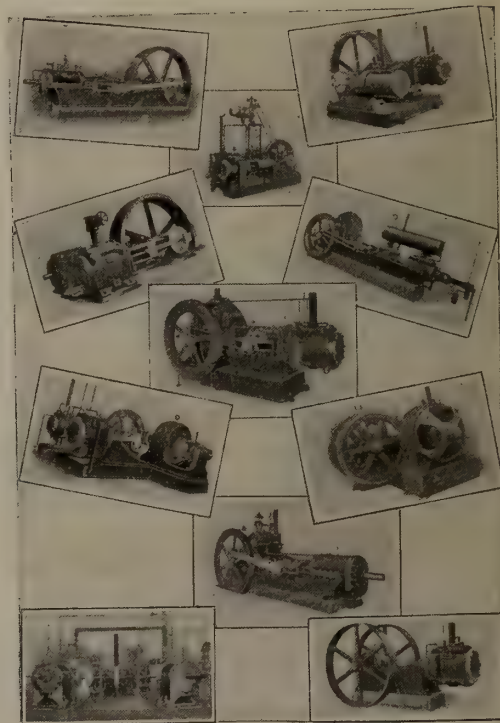
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



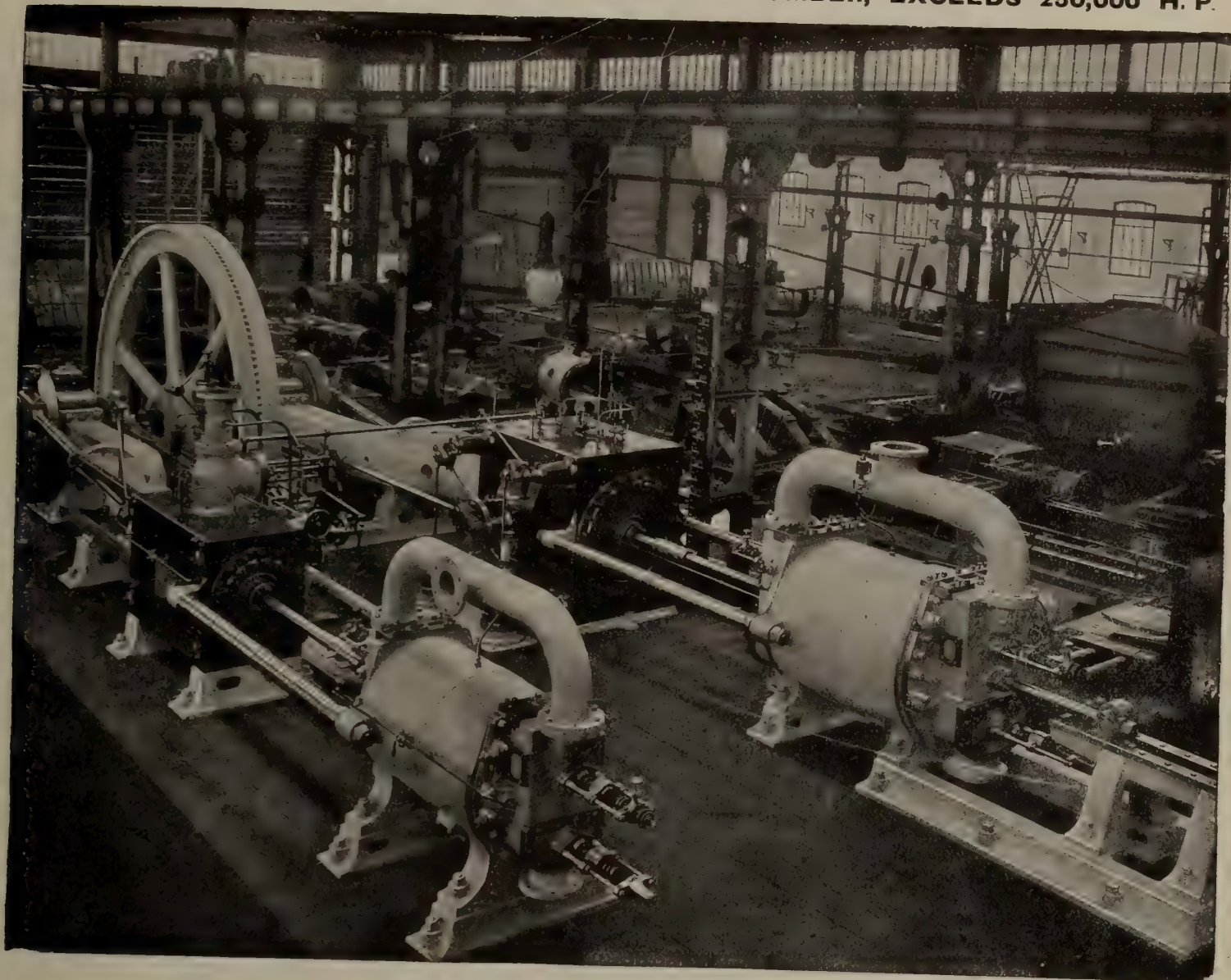


# WALKER BROTHERS

## WIGAN, ENGLAND

# AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us, Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIR,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

(Signed) pro S. PEARSON & SON, E. W. MOIR.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons

## Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

# MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices

LONDONNEW YORKPARIS

# J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

# STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASGOW, N.S.



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

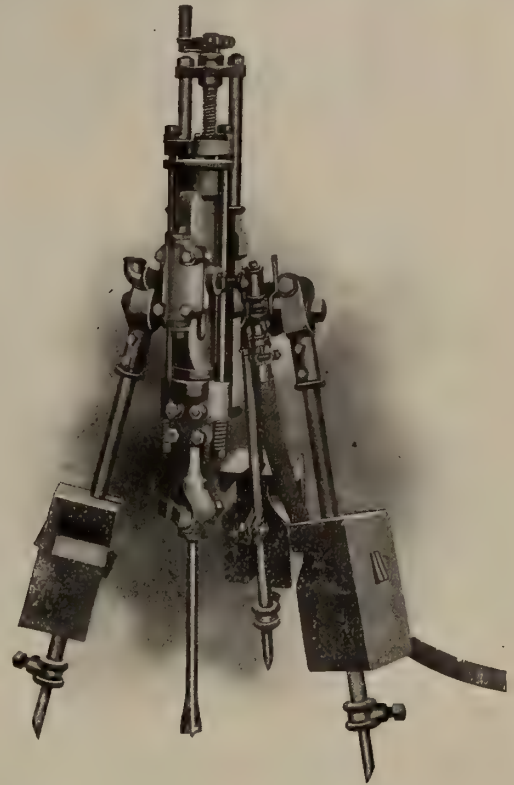
# ROCK DRILLS



# Sullivan Rock Drills

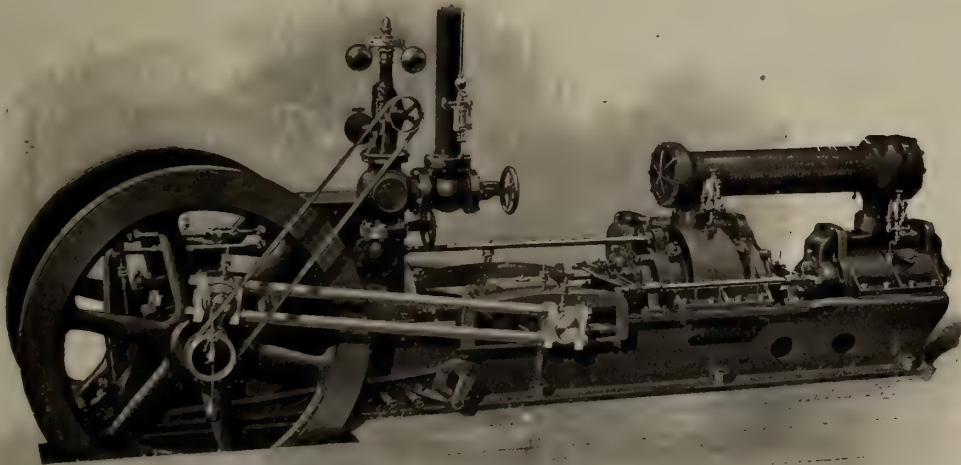
GREAT CAPACITY  
FEW WORKING PARTS  
SMALL REPAIR COSTS

SULLIVAN and BULLOCK  
DIAMOND CORE DRILLS.



# AIR COMPRESSORS

COMPLETE LINE



MODERN

EFFICIENT

ECONOMICAL

HOISTING  
ENGINES.

To insure Prompt Attention,  
address Dep't 7.

# SULLIVAN MACHINERY CO.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.

135 ADAMS STREET  
CHICAGO - - U. S. A.

NEW YORK  
PITTSBURG



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence

in Bituminous Coal and Coke

for Blast Furnaces, Foundries,

Manufacturing and Domestic

Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,  
President.

CHARLES FERGIE,  
Vice-Pres. & General Manager.

D. FORBES ANGUS,  
Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve" coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention. By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.

**G. H. DUGGAN, 2nd Vice-President and General Manager.**





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

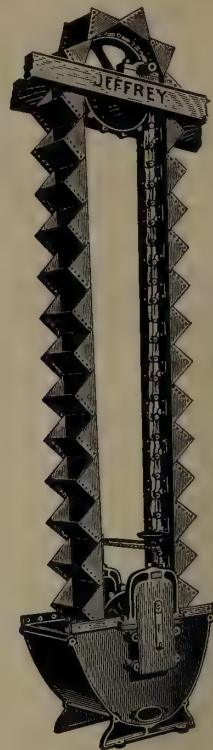
COAL CUTTERS

Power Drills

Screens

Crushers

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.

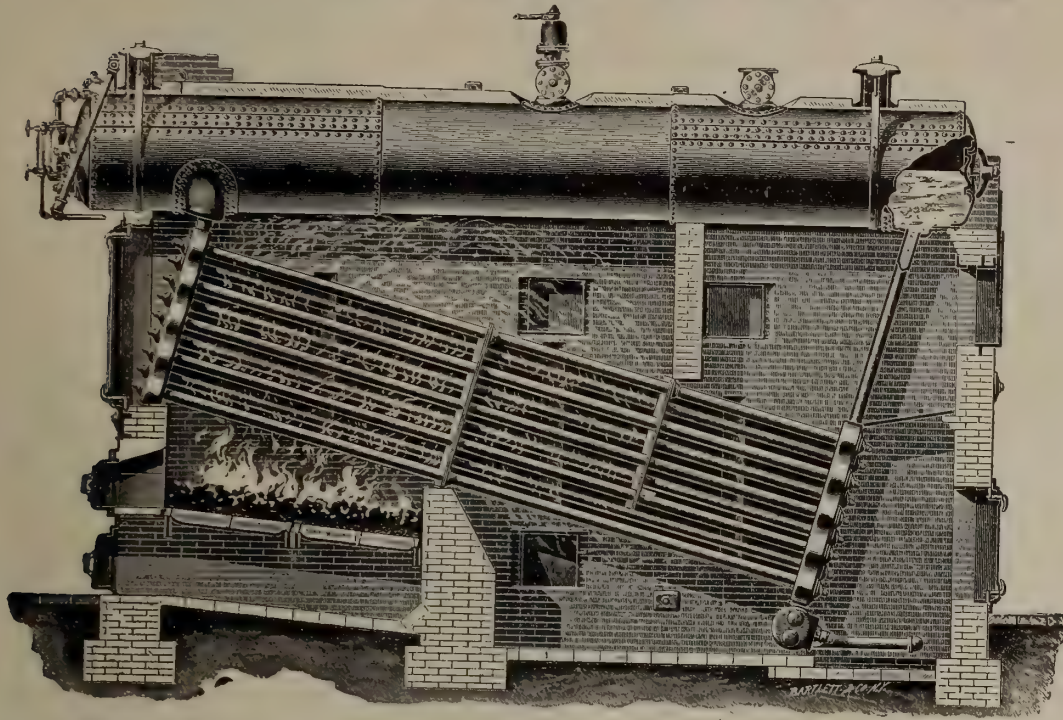


NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



WATER TUBE

STEAM...  
BOILER...

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book. "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

## Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

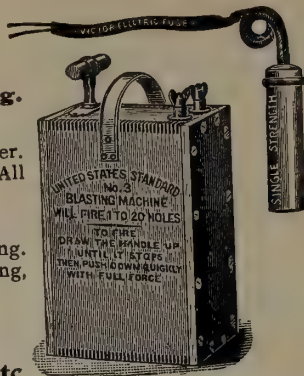
## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**



SEND FOR  
CATALOGUE

# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

# DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address,

MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P.Q.

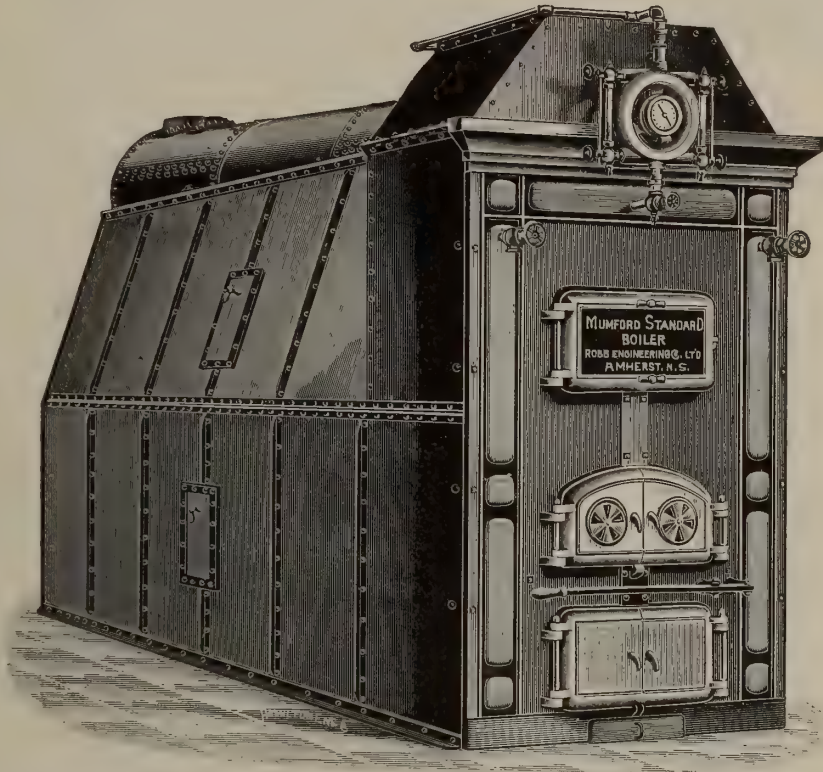
# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam  
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron  
Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulcan Iron Works. **OTTAWA**



## The Mumford Standard Boiler



### Proved a Success

This boiler has been built by us for several years, and is used from the Atlantic to the Pacific with most satisfactory results. It combines, to a remarkable extent, the best features of other types of boilers.

### Saves Fuel

The firebox is entirely surrounded by water so that no heat is lost by radiation or by air leakage which takes place in brick-set boilers. An internal furnace saves at least 10 per cent. over an external furnace.

### Perfect Circulation

The boiler consists of an upper and lower drum connected by two necks giving continuous and rapid water circulation. This causes the water to absorb more heat and makes the expansion uniform.

### Easily Cleaned

Two settling chambers are provided for catching deposits of scale making material, and all parts of the boiler are accessible for cleaning.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**BRANCHES :** WILLIAM McKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

#### 1. THREE YEARS' COURSE FOR A DIPLOMA IN

- (a) Mining Engineering.
- (b) Analytical Chemistry and Assaying.

#### 2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN

##### GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

##### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

##### GROUP III.

- (h) Biology and Public Health.

#### 3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY

for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

#### 4. POST-GRADUATE COURSE FOR THE DEGREE OF

Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

**Next Session begins  
October 1st, 1902.**

**MATRICATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE

## WIRE ROPE

FOR ALL PURPOSES.



Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

Special Arrangement for Curves at the Sherrard Mine.

805-807-809 North Main St., St. Louis, Mo.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

## RICE LEWIS & SON LIMITED

HARDWARE TORONTO

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

# STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.

## A. LESCHEN & SONS ROPE CO.

SOLE MANUFACTURERS OF

Patent Flattened  
Strand Wire Rope



Trade Mark Registered  
REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

## LESCHEN'S Aerial Wire Rope TRAMWAYS

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

BRANCHES: New York, Chicago, San Francisco.

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW      A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

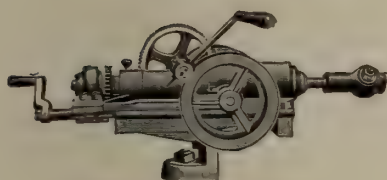
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

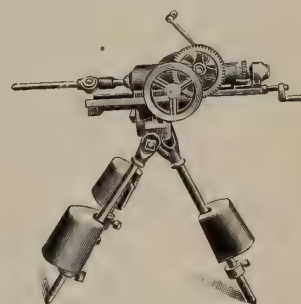
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.

## The Colorado Iron Works Co. DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.  
DENVER, Colo.**



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
Metals, Mattes, Etc.  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address : - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather  
MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING  
ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N. J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL

FOR  
NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and  
Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES :

Trusts and Guarantee Building  
16 King St. West, Toronto, Can

Cable Address : CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty :

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**  
CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel **Montreal.**

20 years' experience in the Mining and Reduction of Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**  
CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**

28 years' experience in the equipment and operation of large Hydraulic, Deep Gravel, Drift and Gold Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street **MONTREAL**

**ASSAYS OF ORES**

ANALYSES of all materials made with greatest accuracy.

SAMPLES BY MAIL—1 cent 1 cr 4 ozs.; limit 24 ozs.

INSTRUCTION IN ASSAYING, Etc., to Prospectors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**  
CIVIL AND MINING ENGINEER  
30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals (earthy and metalliferous), Artesian Wells and Oil Springs, also Deep Soundings for Harbors, Rivers, Canals, Tunnels and Bridge Foundations. Quarry Sites and Clay Fields tested.

Plans and Sections made showing result of Borings—Gold Drifts tested to Ledge by the new Pneumatic and Hydraulic Tube System and the yield ascertained—Flumes, Ditches, Monitors and Placer Mining Plant generally designed and constructed. Properties Examined and Reported on, Assays made.

**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and reported on. Plans and Estimates on Concentrating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,

**MONTREAL.**

Analyses and Assays of Ores, Fuels, Furnace Products, Waters, etc. Mines and Mining Properties examined and valued.

**FRANK B. SMITH, B.Sc.**

CIVIL AND  
MINING ENGINEER

Certificated Colliery Manager Great Britain and British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**

MINING  
ENGINEER

No. 45 Broadway

**NEW YORK**

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**

Civil and Mining  
Engineers.

Surveyors and  
Valuers.

8-KING STREET-8

**MANCHESTER, ENGLAND.**

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.

**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling Plants.

**J. C. GWILLIM, B.Sc.**

MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**

MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**

CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation.

Reports.

Development.

**Montreal.**

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

879 DORCHESTER STREET, MONTREAL

CANADA.



## The Jenckes Machine Company

We will gladly give to all interested persons who require full information about . . . .

### THE HERRESHOFF SMELTER

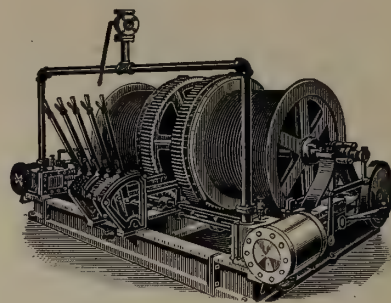
which we have successfully installed in plants throughout the Dominion of Canada.

427 Lansdowne Street

Sherbrooke, Que.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS. Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

E. LEONARD & SONS

MONTREAL, QUE.

ST. JOHN, N.B.



## WIRE ROPE

"ACME" brand extra tensile strength for heavy work.

Should only be used on special large wheels and drums.

## The B. Greening Wire Co. Limited

MONTREAL, QUE.

HAMILTON, ONT.

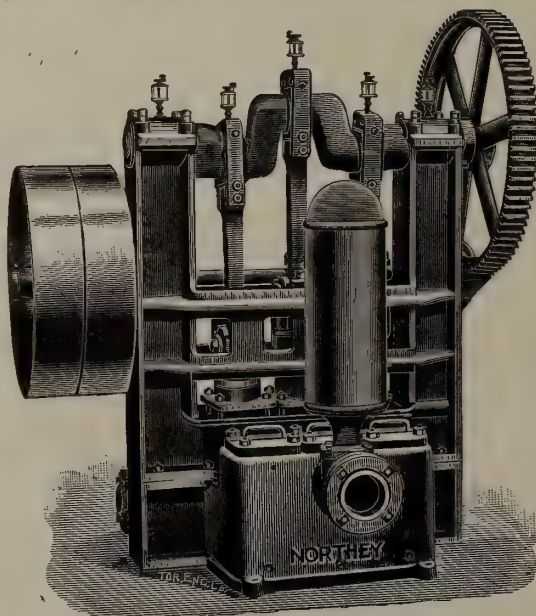
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.

### THE NORTHEY CO.,



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

### Limited, Toronto, Ont.



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 4.

APRIL, 1903.

VOL. XXII., No. 4.

## The Dark Hour of the Dominion Iron and Steel Co., Ltd.

The Dominion Iron and Steel Company has certainly had a full measure, pressed down and flowing over, of the trials and tribulations incidental to the launching of a new enterprise on a large scale. These troubles have fallen thickly and heavily lately, and as a natural consequence have raised doubt and distrust in the minds of the investing public. A strong "bear" attack on the stock by Boston operators, precipitated, it is said, by the foolish attempt of the President's son to "bull" it (for which his father ought to soundly spank him when he gets back from the Mediterranean) succeeded beyond the expectations of the originators of the movement. The securities of the company collapsed like a pack of cards. No rescue came from the Directors and their associates. These gentlemen, who for their own selfish ends had forced the common stock up to a fictitious value and had gulled thousands of small speculators throughout the Dominion into buying thereat, stood by and allowed the "bears" to do their worst. It is even said that some of them (Directors of the Company at that) joined in the game and made much money by selling "short." The common stock fell 20 points in an incredibly short space of time and the bonds and preferred stock shared in the "slump." On the top of this came the unfortunate fire at the Dominion No. 1 Colliery of the Dominion Coal Co. which the "bears" made the utmost use of to renew their savage attacks on the stocks of both companies. And as if this was not sufficient, our old friend, Mr. Cornelius Shields, the 2nd Vice-President of the Steel Company and General Manager of the Coal Company, who had been looked upon as the "strong man" destined to save the situation, suddenly and without warning threw up his appointment. Viewing his action in leaving Sydney for a higher salary at the Soo, side by side with what some of his associates on the directorate have done in looking after themselves, Mr. Shields can hardly perhaps be severely blamed, but he certainly chose a very inopportune time for bettering himself.

It is small wonder then that the common stock tumbled over 30 points. And yet after all we need not blame the present state of affairs altogether upon the causes above mentioned.

An intelligent observer, who has carefully and dispassionately followed the somewhat meteoric career of the Dominion Iron and Steel Company, might justifiably conclude that if the gentlemen who some 18 months ago assumed the task of guiding the destinies of the company, had paid closer attention to a businesslike and economical working out of the proposition, and less time and thought to newspaper "puffing," and to the manipulating of the securities of the com-

pany on the stock markets of Montreal and Toronto, it is more than probable that order instead of something akin to chaos would to-day prevail at the Sydney works. And as a further and most important consequence, the investing public would not now be bewailing the loss of many millions of dollars, and saying nasty things of some of the Directors. A somewhat fierce light has latterly been thrown upon the management, or rather mismanagement of the Steel Company. It would appear as if one of the soundest and most promising business propositions ever laid before the public had been brought perilously near to absolute failure by a series of almost incomprehensible blunders, perpetrated by men whose reputations stood high in the commercial and industrial world. No industrial undertaking had ever been launched—in Canada at any rate—under fairer auspices. Here, after many years of conjecture and hope, was at length to be fulfilled the dream of developing our own great natural resources, and of placing Canada among the great iron and steel manufacturing countries of the world. The location of the works at Sydney seemed to be an ideal one to command the assembling together of the requisite constituent raw material at the very lowest possible cost. The venture was generously subsidised by the Dominion Government. It appealed to the imagination and patriotism of our people throughout several provinces and they eagerly poured their subscriptions for stock into the treasury. Our New England friends, following the lead of the man whose genius has already done so much for Cape Breton, were almost equally enthusiastic. The scheme deserved and claimed success, but, alas! it is humiliating to compare early promise with fulfilment after a lapse of nearly four years. The company's history has been one of kaleidoscopic changes, of extravagance, vacillation and blundering. South Africa as a graveyard for military reputations finds a parallel in Cape Breton as a place of interment for reputations won in various fields of industry. To attempt to fix the blame for failure would be a disagreeable and invidious task. Let the dead past bury its dead. And yet in bare justice to those who have been swept from power, it is only fair to state that the present controlling influence has done little to justify a change from which such great things were expected. When the control of the coal and steel companies passed into distinctively Canadian hands, there was great jubilation, and great results were prophesied. But the re-action against the alleged weakness and extravagance of Messrs. Whitney, Moxham *et al.* has, for some unaccountable reason, failed to re-act, and Messrs. Ross, Cox and Forget stand arraigned by a bitterly disappointed public for having lamentably broken down on the promises and predictions that were made by them, either personally, or by proxy, in the fall of 1901. If the securities of



the Dominion Steel Co. have earned an unenviable and unsavory reputation as a medium for stock exchange gambling and manipulation, the present controlling interests are to blame. No extravagance that the former management may have had to answer for could have given the enterprise a blacker eye than has been administered by the very questionable methods pursued on the Montreal and Toronto Stock Exchanges by men who are very closely identified with the magnates who wield supreme influence in the affairs of the company. And in this connection it strikes us as unfortunate, to say the least of it, for those responsible for the appointment, that the vice-presidency of the company should have been bestowed upon a gentleman who is a member of the Montreal Stock Exchange, and partner in a firm that is credited with being able to manipulate at will many of the stocks that are traded in on that market.

But apart from this regrettable aspect of the case, the direction of the company's operations at Sydney has been weak and ineffective, where it was confidently expected to be strong and decided. It was discovered very early in the history of the company that certain difficulties had to be met and overcome. These difficulties must have been fully understood when the Canadian control was established, but we have yet to learn that prompt and determined measures were taken to grapple with them. Hence it comes about that to day the output of pig iron and steel is far below what it should be, as a consequence of an inadequate supply of coke. It is almost ludicrous to find that in Cape Breton, of all places, an industry should be hampered and crippled by a lack of fuel.

Any one who has visited Sydney during the past two or three years could hardly fail to be struck by the frequent changes in the official staff of the company, and the feeling of unrest and uncertainty that has prevailed among its employees. This state of affairs still exists and the sooner the office and operating staff is placed upon a definite and permanent footing, the better for economy and efficiency.

If our remarks have been pitched in a pessimistic key it is certainly not because we believe the present situation to be hopeless, or that we have lost faith in the undertaking—far from it—in spite of all that has been done that should have been left undone, and of many things left undone that should have been done. We are convinced that the proposition of making iron and steel at Sydney and turning it out at a handsome profit, is as sound and feasible as it was from the first thought to be. Of the coal end of it there can be no shadow of doubt. The possibilities in this direction are only now beginning to be fairly understood, and we see no reason why, with proper management, the kindred industry cannot be redeemed from its present apparent state of failure.

More than ever before, those in control, in view of recent events, owe it to the company, and to Canada at large, to get right down to business and to bend all their energy and skill to a sound and vigorous policy that will place the undertaking upon the footing its inherent strength and merit entitles it to occupy.

And in the firm belief that this can and will be done, THE REVIEW expresses the hope that the present dark hour is only the darkest one that precedes the dawn of better and brighter things.

#### Imports of Mining Machinery.

The imports of Free Mining and Smelting Machinery for the first two months of the year amounted to \$107,404, the bulk of the machinery as usual being supplied by American manufacturers. Machinery to the value of \$9,263 was also imported under the dutiable list. Diamond drills (exclusive of Motive Power which is subject to duty) were also imported of declared value of \$3,370.

#### The Fernie Strike.

Viewed from several standpoints the Fernie strike and its settlement may be classed among the most important events which have yet transpired in connection with labour disputes in the Dominion. At one time or another during the continuance of the strike most of the problems which have arisen in the relations between Capital and Labour on this Continent were brought to the front, and one at least, and that the most important, was satisfactorily solved. Too much credit cannot be given to the gentlemen who formed the Conciliation Committee for their able, tireless and successful efforts, the result of which is not only a triumph for themselves but a far greater triumph for the principle of conciliation in labour disputes; one extremely satisfactory feature of the whole matter is that since the settlement has been effected all parties interested have united in a testimony both to the value of the services rendered by the Committee and to the all round fairness of the terms ultimately agreed upon.

It is not our intention at this late date to make a *resume* of the whole dispute, most of the features of which are now matters of common knowledge. But there are certain aspects of the case which are well worth consideration and which fall within our province. On these we propose to comment.

The first point which strikes one now that the whole affair is over is that a strike was totally unnecessary, viewed from every standpoint, and while it is not our intention to apportion blame, it is quite obvious that a little more tractableness and forbearance on both sides would have prevented an open rupture. We can hardly think, in the light of the information elicited by the Committee, that the main cause of the action of the men was the wage question. At an early stage of the quarrel an authenticated statement was published by the management which showed average earnings of coal cutters ranging from \$4.50 to \$4.70 per day, and, although the accuracy of these figures was disputed, the men were unable to prove their contention that the earnings had been exaggerated. Such earnings, are fairly representative of what men can make under normal conditions and must be considered satisfactory, although it is only fair to point out that they are not excessive compared with the earnings of miners in other coal districts at the time. For instance, Mr. Dunsmuir, in a public statement made last month, in connection with the closing of his Extension Collieries, stated that his miners were earning \$4.60 per day. The Dominion Coal Co., advertising for miners, openly stated that they can make from \$3.00 to \$4.50 per day; undoubtedly a miner with \$3.00 per day in Nova Scotia is as well off as one with \$4.50 in British Columbia. At the same time we repeat that such a wage must be considered satisfactory to say the least of it. In the ultimate issue the wage schedule agreed upon at Fernie is, taking it altogether, the same as it was before the strike. The yardage, which only forms a small percentage of the work performed by the miners, has been graded according to its actual value. This item averages a reduction ranging from 50 p.c. to 75 p.c. on previous rates but will not appreciably affect the earnings of the miners. As to cutting rates, which form the real basis of miners' earnings, there are increases of 5 cents per ton at Michel, 10 cents per ton at Morrissey, and a reduction of 5 cents per ton in No. 1 mine at Fernie, the latter, however, being due to the introduction of a better class lamp than heretofore used, which it is claimed by the management does not handicap the miner and therefore entitles the Company to a rebate of 5 cents, the amount originally advanced to miners when lamps were introduced. Mr. Doherty, the President of No. 6 District Union, correctly summed up the result of the settlement as affecting wages by saying that "there was a slight sacrifice on the part of the few for the benefit of the money,"





MR. CORNELIUS SHIELDS

Who has resigned the management of the Dominion Coal Co. to take direction of the enterprises of the Consolidated Lake Superior Co. at Sault Ste. Marie, Ont.



## DOMINION IRON AND STEEL CO. LIMITED.



Shipping Piers and Ore-handling Plant at Sydney, Cape Breton.



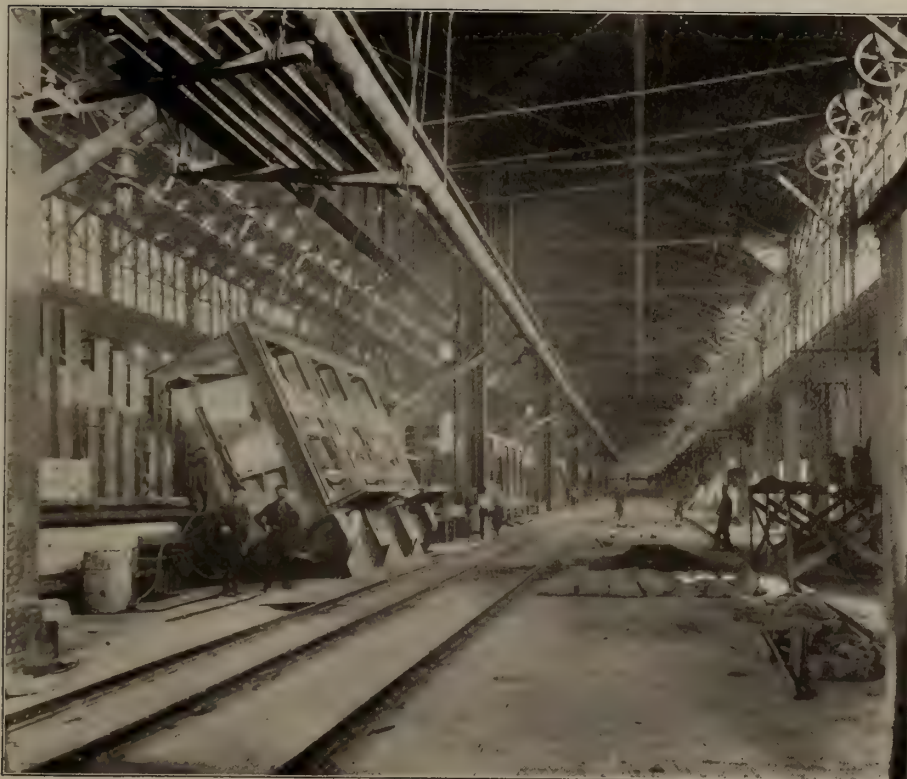
Blast Furnaces—The stacks are 20 ft. diameter at the base and 85 ft. high ; diameter of hearth 11 ft. 9 in. ; at stock line 14 ft. 6 in.



DOMINION IRON AND STEEL CO. LIMITED.



Panoramic View of Furnaces and Steel Plant at Sydney, Cape Breton.



Interior Open Hearth Plant.





MR. G. H. DUGGAN, C.E.

Who succeeds Mr. Cornelius Shields in the management of  
the Dominion Coal Co.



More important than the wages settlement however, which involves so slight an alteration, is the settlement of many vexed questions affecting the relations between the management and organized labour. Probably if the truth were known these were the points which precipitated the struggle, for in the early stages of the work of the Conciliation Committee it was discovered that there was a total lack of confidence between the two parties to the dispute, neither would trust the other, and this estrangement had to be reconciled before progress could be made. It is hardly necessary to say that no permanent success can attend any concern unless the relations between the management and the workers are satisfactory. In this respect the Conciliation Committee were able to bring about a complete change, and to inaugurate what we believe to be an era of peace and prosperity. The refusal of the Company to recognize organized labour, or to meet the accredited Representatives of the Union in the first instance, was long ago seen to be a mistake, equally so the refusal to afford facilities for the Union to erect Meeting Halls; both positions have been abandoned by the Company. The Union is recognized, and a clause has been inserted in the settlement by which the management agrees in future to meet representatives of the Union in case of dispute, so long as such representatives are workmen of the company. They have also agreed to allow the men to acquire lands on which they can erect Meeting Halls, and as the other vexed questions of Company stores was solved during the progress of the strike, by the Company selling out their stores and abandoning the business, there is, so far as we can see, no bone of contention now remaining about which trouble or misunderstanding can arise. The company are to be congratulated on having abandoned an untenable position with respect to organized labour. Whatever may be the regrettable excesses or abuses indulged in by Union men, no sane person will maintain that the "principle" of Unionism can now be antagonized. This position has been taken up by many capitalist corporations but every one of them has met with defeat. The only man to-day who seems to stand by his right to refuse recognition in any form to Trades Unionism is Lord Penrhyn, who has fought the principle all his life and who seems likely to die unconvinced; but so much misery has his attitude caused that there is even at the moment talk of Government intervention, in what would almost appear to be an unconstitutional manner as affecting the rights of property, but the bare proposal that the Government should step in, and by "*force majeure*" compel his Lordship to operate his quarries and settle his labour difficulties, shows the attitude of public opinion on this important matter. On the other hand the very fact that the right of organization has been conceded and the full recognition of properly accredited delegates has been made, only adds to the responsibility of Unionism in enforcing the observation of law and order. While public opinion will not for a moment support an employer in his refusal to recognize Unionism, it will undoubtedly support him to the full extent in his refusal to be coerced, bullied or injured by unreasonable or illegal action on the part of Labour representatives. In this connection we have no hesitation in condemning the "Walking Delegate" as a constant menace to the peace and prosperity of a community and as great a source of danger and loss to Labour as to Capital.

The other point which is emphasized by this struggle and about which we have had occasion to speak before is the absurdity of Canadian Labour Organizations being under the control of American Unions. There is little doubt that the alien element had much to do with the inception of the Fernie strike, and while of course it is the right and privilege of every labouring man to belong to whatever Trade Union he chooses and to submit if he sees fit to the domination and control of alien organizations, at the same time we are convinced that if fully understood all the bearings of the question he would see

that it is both illogical and unprofitable for the Western Federation of Miners to control Canadian Lodges. We hold that the greatest benefit which Labour can derive from international association is by correspondence and periodical Congresses between the leaders, such as those which are held in Europe where there is an annual gathering, sometimes in London, sometimes in Brussels, sometimes in Berlin or Paris with a general interchange of ideas and comparing of notes, but when it comes to a large and wealthy country with different tariff and fiscal laws, geographically placed so that competition in all branches of industry is inevitable, controlling the Labour market of this Dominion, it is obvious that such a condition is one in which all the advantage belongs to the "predominant partner."

In addition to the satisfactory character of the settlement as affecting details, it is a matter of general congratulation that by mutual agreement the present compact exists for two years certain, and for three years subject to sixty days notice. The Kootenays may therefore look forward to an area of prosperity, we trust unbroken by any further disputes, and an opportunity will thus be furnished to the Crows Nest Pass Coal Co. to overtake the rapidly increasing demand for coal and coke.

### Bell's Asbestos.

The report of the Directors for the year ended 31st December last. Submitted to the Shareholders on the 20th ultimo, shows a net profit of £4,385. 8s. 3d. To which has to be added the amount brought forward, £2,538. 10s. 8d leaving for appropriation £6,933. 18s. 10d. The Directors recommend the payment on 22nd April, of a dividend at the rate of three per cent. and to carry forward £3,333. 18s. 10d. In the accounts the Company's Mine, Buildings and Machinery at Thetford Mines, Que., is valued at £78,847. 17s. d.

### Mining Possibilities of the Canadian Rockies.

By BERNARD MACDONALD, Spokane, Wash.

#### INTRODUCTION.

As its title indicates, the object of this paper is to show the possibilities of the Canadian Rockies, as a mining field.

The scope of mining, referred to here, is intended to cover the mining and production of the precious metals only. And by way of preface to the general discussion of this subject, the important part that a large stock of metallic money plays in the development and commercial greatness of a country, is noted, and, in this connection is also noted that the present money circulation of Canada is inadequate, and the means of obtaining, and the advantage of possessing a larger money circulation are suggested.

It will be shown by inference that in the region of the Canadian Rockies, the mineral resources of which, are as yet, undeveloped, lies the source of an enormous supply of the money metals. In proof of this, reference is made to the enormous production of gold and silver from such portions of the Rocky Mountains as lie within the other countries of North America, and the deduction is made, that there being no general difference between the geological structure of the portions of this range of mountains within such countries and the portions of them within Canadian territory, equal production should result from the latter portion when explored and developed to an equal extent.

A large production of precious metals within a country is an object of great national importance, for these furnish the home supply of gold and silver coin, which is recognized as the money of ultimate redemption in the monetary systems of the civilized nations. All other



forms of money come under the head of the promissory or token class, and their recognized, or negotiable value, is based on the probability of their ultimate redemption in standard coin or bullion, at their face denomination. Gold and silver coin, or bullion is, therefore, to be taken as the basis of all current standard money. The proportional size and soundness of the monetary system of any nation, will be in direct ratio, other things being equal, to the size of the metallic base upon which it rests. And, it is a generally recognized fact that the volume of the business that any country is capable of sustaining, is measured by the volume of the stock of current money in that country; while the amount of successful business transacted in a country, is the true measure of its prosperity and commercial greatness.

These premises being true, it follows that the prosperity of any country is in direct ratio to the volume of metallic money, or money metals, constituting the base for its currency circulation. And, as prosperity ministers best to the wants, and otherwise contributes to the happiness and greatness of the people of a nation, it is the plain duty of governments, acting through wise legislation, to provide means and measures, under the operation of which, the people may accumulate a large volume of metallic money.

If the industrial conditions of Europe, during the closing years of the 15th Century, when the stock of gold and silver money then existing in that continent, is estimated to have been only \$193,000,000, be contrasted with the industrial conditions at the present time, when the stock of gold and silver is about 20 times as great, the improved conditions that now exist will go to prove these conclusions. Moreover, on careful investigation, I think it will be admitted, that the improved industrial condition and modern prosperity of the world in general, is due, in a very large measure, if not entirely, to the influence of the money metals that have been mined, coined, and put into circulation since the close of the 15th Century.

Illustrating the valuable effect a prosperous mining industry has on a country, the following reference to the results in the United States for the year just ended, is quoted:

To make clear this wonderful product of things under the earth, this illustration may be given: If the wealth of the nation was wiped out, if its farms were destroyed, its manufactories annihilated, its railways torn up and cast into the sea, its ships sunk—if every vestige of the nation's wealth were to perish and leave only the mines—the mining industry at the rate of last year's (for 1902) return would rebuild the entire structure in 70 years, for its production in that single year, \$1,360,344,747, which including the coal, iron and petroleum, was sufficient to have more than paid the national debt. This statement could not be made of any other country on the earth.

#### THE PRINCIPAL GOLD AND SILVER MINING FIELD IN THE WORLD.

The main source of the precious metals, mined within the last three and a half centuries, has been in the Rocky Mountain Regions. The portion of these mountains within Mexico will be referred to as Mexican Rockies, the United States as the American Rockies, in Canada, as the Canadian Rockies.

The history and progress of mining on this continent from its beginning to the present time, may be briefly summarized as follows:

Early in the 16th Century, shortly after the discovery of America, the regions of Mexico, and the Central and South American countries penetrated by the Rocky Mountains, were invaded by the Spaniards, who found large stores of silver and gold in possession of the Aztec and Indian Aborigines of these countries. After these people were conquered, and their stores of precious metals confiscated and shipped to Spain, the invaders began to search for the mines from which these metals were obtained. These were found scattered through the mountain regions of these countries. The work of mining was then

begun by the Spaniards, who pressed into slavery for that purpose, the conquered Indians. From that day to this the output of the precious metals from these countries has been continuous, increasing or diminishing, from time to time as the domestic conditions of the countries permitted, and as the genius of the inhabitants was able to solve the problems of economic production.

The total production of gold and silver from these countries from that time to the present, is enormous. The coining value of these metals produced in Mexico to date is estimated by statisticians to be about \$5,500,000,000. A similarly enormous production has been obtained from the Rocky Mountains in the other Spanish American Countries, but for the purpose of this paper, it will be necessary to consider, only, the production of the neighboring countries in North America through which the Rocky Mountains run.

As stated, Mexico has produced in the past 350 years, the sum of \$5,500,000,000, which makes an average annual production of \$15,714,285, during that time. As there are about 1750 miles, in length, of the Rocky Mountains within that country, the average production for each such mile of these mountains, was \$3,142,857. The annual production seems small if compared with modern results, but when the small population of that country at this beginning, and for years afterwards, the total lack of modern facilities for mining, the absence of mining and metallurgical knowledge, and the insecurity of property rights, that have existed at times during this period, are fairly considered, it will seem as much as can possibly be expected. At this place, it will be interesting to note that the coining value of the gold and silver produced in Mexico, during last year (1901) amounted to a total of \$65,479,940. This, compared with the average yearly production of the preceeding 350 years, shows an increase of 400 p.c. and proves in the light of past production the inexhaustible mineral resources of the mines of the Mexican Rockies.

#### PRODUCTION OF GOLD AND SILVER IN THE AMERICAN ROCKIES.

For 300 years after the production of gold and silver had commenced in the Mexican Rockies, nothing was done towards the systematic exploration of the northerly extension of this chain of mountains, within the territory now occupied by the United States. After the discovery of placer gold in California in 1849—53 years ago—numerous expeditions of gold seekers started from the Eastern States and other sections of the world, for California. At this time, the intervening plains, then the "Great American Desert," now the most fertile country in the world, lay between, swarming with hostile bands of Indians, while beyond these plains towered the snow-clad Rockies, pathless and unknown except to the fierce tribes of Indians who contested the advance of this invasion. These natural obstacles were soon overcome by the determination of the gold seekers, but when they reached the mines, they knew nothing about mining or metallurgy and could not even recognize the common ores of gold and silver. In addition to this lack of technical knowledge, the regions were inaccessible, for there were no roads or even trails. Under these conditions, progress was at first slow. As years went by however, mining and metallurgical knowledge was being gradually acquired and crystallized into science, in the hard but efficient school of practical experience. Transportation facilities were improved, mining machinery invented, and the production of the metals grew accordingly. From such a beginning, 53 years ago, the production of gold and silver from the American Rockies, increased year by year until it reached a coining value of about \$155,000,000 in the year 1902. This amount brings the total production up to \$4,500,000,000 for the 53 years since the commencement of mining, being an average annual production of nearly \$85,000,000, or \$3,461,539 for each mile in length of the American Rockies.







It will thus be seen, that from a country in which the production of the precious metals was practically nil, 53 years ago, the United States, in its production of these metals for 1902, has surpassed that of every other country. This has been made possible only by the vigorous exploitation of that inexhaustible source of gold and silver—the Rocky Mountains.

#### PRODUCTION OF THE CANADIAN ROCKIES.

The Rocky Mountains, in their northerly course, after passing through the States of Montana, Idaho and Washington, enter into the provinces of British Columbia and Alberta in Canada, and extend northward through these provinces, and the Yukon and Northwest Territories till they pass into Alaska or terminate on the shores of the Arctic Ocean, in the neighborhood of the mouth of the Mackenzie River. Within Canadian territory, these mountains have an approximate length of 1600 miles, by an average breadth of from 500 to 800 miles, and possess the same general structural features, as they do in their southerly extension into American and Mexican territory. For this reason, it is fair to assume, that as already indicated, the Canadian Rockies will yield a quantity of the precious metals equal to that produced by them in American or Mexican territory—mile for mile of their length, when equally developed.

The production, therefore, that may be expected of the Canadian Rockies, in the future may be seen from a study of the following table:

| COUNTRY.           | Miles of Rocky Mount'ns | Av. production per mile. | Total production |
|--------------------|-------------------------|--------------------------|------------------|
| Mexico.....        | 1700                    | \$3,142,857              | \$5,500,000,000  |
| United States..... | 1300                    | 3,461,538                | 4,500,000,000    |
| Canada.....        | 1600                    | 103,750                  | 166,000,000      |

In extenuation for the unfavorable contrast shown by the production of the Canadian Rockies in the past, it may be stated that the climatic conditions prevailing in these mountains, are less favorable, than those prevailing in their extension through the countries south. While admitting that the climate, to some extent, hinders production, undue weight should not be given to this factor, for placer mining operations, which are more readily affected by cold than lode mining, being outdoor work, are carried on successfully in the Klondike, which is practically under the Arctic Circle.

Since the discovery of placer gold in the Klondike region at Dawson City in 1896, the total mining value of the gold produced by that camp, including 1901, has been \$76,500,000 or 46 p. c. of the value of the total production of the Canadian Rockies to date.

That the discovery of other mining camps in these mountains, equally as productive as the Klondike, waits only on the chance efforts of individual prospectors, or the systematic exploration of organized companies cannot be denied. Neither can anyone place a limit on the number of "Cripple Creeks," or "Klondikes" or "Rands" that lie hidden away in the recesses of the 1600 miles of rocky mountains in Canadian territory. A comprehensive, systematic exploration extending over years, only can fully answer this question.

A mining camp may be considered a geological accident, occurring, no man knowing why or wherefore, here and there throughout the Rocky Mountains, and generally occupying an area of not more than a few miles in extent, while, perhaps a hundred miles or more of barren country may intervene, before another paying deposit of mineral occurs. The discovery of these mineralized areas, always limited in extent, and hidden away in the mountain fastnesses, at considerable distances apart, and usually covered by debris or vegetation, and during the winter months by snow, is no easy matter. The

desultory efforts of individual prospectors, without training or experience, may fail indefinitely to locate these treasure vaults. The problem should be attacked systematically by a well organized corps of prospectors, operating under the direction of trained geologists. Prospecting in this way could be done only by large private corporations, properly financed, or by the Dominion Government, in the manner outlined below.

The inefficiency of the desultory efforts of a few prospectors working on their own account to discover the mineral deposits hidden away in so vast a field will be apparent, when it is born in mind that these mountains, averaging 1600 miles in length, by at least 500 miles in breadth, cover an area of more than 800,000 square miles—8 times the total area of England, Ireland and Scotland (see comparative areas shown on map 2).

Any plan for prospecting for the mineral deposits in this range of mountains, in order to be effective and reasonably successful, should be conducted under the auspices of the Dominion Government, or, of strong private corporations. Whether by the government, or by private corporations, the general plan of the campaign should be similar, except as to its scope, which in case of government control should be more extensive than if conducted by private corporations.

Every corporation undertaking to put a prospecting party in the field, should be adequately financed, to carry on the campaign extending over at least 5 years, employing during the prospecting season—6 months—of each year a large force of prospectors. Such a force should be under the general supervision and direction of a field manager, who should be the Geologist in Chief of the party. The working force should consist of say 60 men and be divided into sub-divisions or posts of 6 men each, and these should be encamped in suitable locations in the mountains at say 6 or 10 miles distant from each other, moving camp from time to time as the possibilities of the discovery of paying deposits of mineral in one location became exhausted.

Each post should consist of 3 prospectors, 1 assayer, 1 cook, and 1 geologist, or practical miner. The latter should be superintendent of the post and have immediate charge and direction of the explorations, subject to the general control and instructions of the Field Manager. The duty of the entire force of a post, except the cook, would be to thoroughly explore the mountain areas surrounding their camp. All the rock deposits occurring in these areas, suspected of containing the precious, or valuable metals, should be analysed on the spot, with blow-pipe, by the assayer. When greater accuracy would be required, the rock would be tested at the assay plants of the party, of which there should be at least two, to be carried along as the party proceeded, at equal distance apart, or at convenient positions, so as to afford the greatest accessibility from either end of the line. The assayer of each post, besides his technical duty, should occupy the position of Assistant Superintendent, and besides doing a share of the regular field work, should help to make the sketch maps, reports, and should keep the records and accounts of the work accomplished by his post. The responsibility for the proper execution of such work would, however, rest with the superintendent. The cook, besides the work of cooking, should act as general roustabout of the post, keeping watch over the pack animals, of which, there should be three at each post.

When deposits of pay mineral were discovered by any post, all the land on which such discoveries were made, would be located for the benefit of the corporation, with such interests reserved for the members of the force as should be agreed upon at the outset. Distributed and operating in this way, the advance of the party would cover a line 90 miles in length, and large areas of the Rocky Mountains would be thoroughly prospected during the life of the campaign and the



reports of the officers covering the result of the work, with maps of the portions of the country explored, would be the exclusive property of the corporation. It is scarcely possible that a campaign of this kind would fail to discover one or more areas of paying mineral.

The discovery of one such area during the life of the campaign would pay the corporation probably one thousand fold on its outlay in the enterprise. As an illustration of the industrial potentialities and creative power of a mining-camp, a brief description or history of the industrial results of Cripple Creek District will serve.

That district is less than 6 miles square and has been the theatre of fortune makers on whose stage poor men have developed into multi-millionaires, in which several towns have arisen as if by magic, have been burned to the ground and rebuilt on smoking embers to modern cities of steel, stone and brick. Its hills are gridironed with steel rails, and dotted with the shaft houses of 100 mines in which men work night and day in the production of gold. This camp discovered in 1891, had a total recorded production at the end of 1902, amounting to \$143,458,100, with the last annual production up to \$25,000,000.

Notwithstanding the present activity and prominence of this district, it is interesting to remember that the mineral indications on its surface had been passed over unheeded by prospectors for years. This is another instance, which shows that the unorganized efforts of prospectors failed for years to recognize surface indications of one of the greatest mining camps of the world, a fact which could hardly occur under the more thorough methods of a prospecting campaign as outlined above.

#### PRIVATE CAPITAL NOT LIKELY TO UNDERTAKE THE WORK IN THE MANNER SUGGESTED.

A corporation undertaking a 5 year prospecting campaign, as proposed, would require an available capital to be paid up within that time of \$150,000 to \$200,000. It would be difficult to assemble this amount of money by subscription from men who are absorbed in their own ordinary business pursuits, and who have given no study to the possibilities of mining enterprises, except to the extent of "Taking a Flyer" in some stock speculation. Moreover, all the capital of business men is generally required to meet expansion in their own special lines of business, and, there would be little or none available to go into an enterprise of this kind.

In the Dominion of Canada, the per capita circulation of all classes of money, is estimated to be about \$15. This amount is totally inadequate to properly sustain the necessary current business of its people, for which there should be, at least, a money circulation of \$40 per capita. But not having much over one-third of this amount, the consequence is that the home accumulation of idle capital, that can be safely withdrawn from the ordinary commercial pursuits, is not sufficiently abundant to finance such industrial enterprises, as are required to develop the country's natural resources. As a result, a large portion of the Canadian youth emigrate to find employment for their brain and muscle, while on account of the lack of home capital, even the choicest natural resources of a country remain undeveloped, or fall as plums to foreign capital. As it is a part of the object of this paper to indicate how the money metals held by Canada, as the basis for its Monetary system could be increased, thereby incidentally increasing the per capita circulation which would ultimately result in accumulations of home capital that would be available for the development of the country's natural resources, that subject will now be briefly discussed. The increase of the money metals in the country might be brought about in two ways:

1. By selling to foreign countries merchandise of greater value than would be purchased from them, thereby securing what is known as a favorable balance of trade.

2. By mining and retaining in the country as coin or bullion, the money metals mined from its territory.

The former method involves the complex intricacies of internal and international commerce, and has only a subsidiary bearing on the purpose of this paper which is, in the main, to point out the possibilities of the National Mining Field—the Canadian Rockies—and the best method of developing its resources.

#### HISTORY OF RECENT DEVELOPMENT IN THE CANADIAN ROCKIES.

In the early '90's, the province of British Columbia which covers about 800 miles in length of the Rocky Mountains, had a very satisfactory code of Mining laws. At about this time, prospectors coming over the border from the mining region to the south, discovered the mineral deposits in the Slocan, Rossland, and other districts along the International boundary. They were shortly afterwards able to sell their finds for remunerative sums. The news spreading over the country induced a large emigration of prospectors, miners and capitalists to come into the mining camps of the province, and the vigorous exploration and development of the region was proceeding.

When everything was thus promising well for the future, one untoward event after another interposed, and progress was checked. Some of these were circumstances over which the people of the Province had no control. But the most damaging to the mining industry, was the enactment of laws, unfavorable to it by the Legislature of British Columbia. Against the protest of the mine owners, and the business men in mining communities, the Legislature continued to pass laws annually, for several succeeding years, that affected the Mining Industry, more or less, unfavorably.

Not knowing where the end of such legislation might be, the agents of the capital seeking mining investments, were called away from the Province, and prospectors, not finding purchasers for their discoveries left also, so that, at the present time, it is doubtful if there are more than 200 *bona fide* prospectors at work in the vast area of the 400,000 sq. miles of the Rocky Mountain Cordillera that lie within the Province. For this reason, few, if any, discoveries are being made in British Columbia, and few, if any, new mines are being developed, mining operations being confined to the development or extraction of ore, from the mining properties that were purchased some years ago.

These effects, due mainly to bad Provincial legislation, were first felt in the towns and mining camps, then at the more distant business centres, and finally at the coast cities. The general falling in business, which has taken place all over the Province, appears in strong contrast with the general prosperity existing in the other Provinces of the Dominion, or in the Mining States of Mexico, or in the American Mining States just across the International border.

In these States the Rocky Mountains are swarming with prospectors, new mineral areas are being discovered, capital is flowing in, the Metal output is increasing, and prosperity abounds.

It is believed that the conditions that have thus far contributed to destroy the prosperity of the Province, will be corrected so far as possible, at an early day, for the people are now thoroughly awakened to the exceptional condition of their Province, and are demanding such legislation as will encourage and protect capital seeking mining investment. Therefore the repeal of the obnoxious laws now existing on the Statute Books, and the substitution therefor of a new code of mining laws that will be favorable, or at least, fair to the mining industry, may be confidently expected.

But the agents of capital have left the Country, and so have the prospectors. These people are profitably engaged elsewhere and now the great question to be solved, is, how to get them to return? Confidence must be restored in some unusual way to be effective within a reasonably short time.



## INDIVIDUAL PROSPECTING INEFFECTIVE.

The situation demands that immediate steps be taken along lines already suggested and to be further referred to later in this paper, to carry on the work of prospecting, under the direction of strong comprehensive organizations, on private account, or, by the Dominion Government. A strong movement of this kind, would do more than anything else to induce the tide of emigration to flow towards these regions once more.

Everybody, including the prospectors themselves, is aware of the inefficiency of unorganized individual prospecting.

Year after year, individual prospectors go for a few months, each season, into the mountains to search for the indications of mineral deposits. Having no records of past efforts of this kind to guide them, they may spend the entire season going over the same ground that had been fruitlessly examined, perhaps for each of the several previous seasons, by other prospectors. In the same way, the same ground may absorb the efforts of other prospectors in succeeding seasons. This waste of effort will continue until the exploration of the Canadian Rockies is undertaken in a more intelligent way.

No one knows how many "Rands" "Cripple Creek" or "Homesakes" lie hidden away in these mountains, but no one can fail to see how, under existing conditions and by existing methods, such deposits might remain undiscovered indefinitely, unless the work of exploration is taken up systematically by private corporations, or the Government.

## GOVERNMENTAL EXPLORATION NECESSARY.

Systematic exploration could be most effectively carried on by the Dominion Government, the concessions for the temporary occupation of the territory of British Columbia, if any were technically necessary, could be readily secured from that Province. Under the auspices of the Dominion Government, a prospecting party, 5 times as large as the one outlined for private corporations, should be placed in the regions for a campaign of exploration extending over a period of 5 years. The result could hardly fail to be successful, 300 men exploring a region with military precision, under the direction of the best executive talent, advised by the best geologists, would certainly result in finding some of the hidden wealth in these regions. If exploration were undertaken in this way, immigration and capital would follow quickly into these fields.

Once a government prospecting party was in the field, there would be hundreds, if not thousands, of camp followers. Discoveries would be rapidly made, and developed, and the metal output would soon come up to that of the American or Mexican Rockies.

Canada would then have the opportunity of accumulating a large stock of precious metals, which, as bullion, or coined, would warrant the increase of its *per capita* money circulation to a sum equal to that of the United States. Accumulations of home capital would follow which would be available for investment in enterprises organized for the development of the natural resources of the country.

## WAYS AND MEANS.

If the exploration of the Canadian Rockies were undertaken by the Government, the first thing to be considered, would be the methods of finance and provision of means for the proper supervision and administration of the undertaking. These details might, doubtless, be accomplished in a number of ways, but the following seems to the writer to be most expedient and effective.

1. The creation of a Department of Mines and Mining, the head of which would be a member of the Cabinet.

2. To finance this department, the Dominion Government would make a Note Issue of \$5,000,000, and place this sum at the disposal of the Minister of Mines.

3. The Minister of Mines would purchase bar silver in the open market from time to time, as it could be coined at the Government Mint hereinafter provided for.

4. The 10,000,000 ozs. of silver that could, presumably, be purchased with the \$5,000,000 Note Issue, would coin into at least \$10,000,000 of standard half dollars or subsidiary coin.

5. The \$10,000,000 thus created, would constitute the funds available for the Minister of Mines to carry on the work of this department, which would include.

6. The erection of a Government Mint Building at the National Capital for the coinage of the nation's metallic money.

7. The erection and suitable equipment of a building at the same place to be known as the Department of Mines and Geological Survey Building.

8. The appointment of a Department Board, or Mining Commission, of say three persons who should act as assistant secretaries to the Minister of the Mines. The duties of this Board or Commission, their official capacity, as aides, assistants and advisors of the Minister of this department would be to study the requirements of the mining industry in matters of National and Provincial Legislation, transportation, reduction and refining works, labour troubles, etc. and advise wherein, in their judgment, the Industry could be benefited by change or modification of existing conditions.

## GOVERNMENT PLAN.

Organized in this way the Dominion Government would be thoroughly equipped to carry on, systematically and effectively, a comprehensive plan of exploration of the Rocky Mountain regions within its domain.

The plan, while following the same general lines, as that proposed for private corporations, would, in some particulars, be essentially different, inasmuch as the exploration carried on by the Government, would be for the benefit of the whole people, and not for the discovery of mines to be worked for private gain.

When a discovery would be made, it should be publicly announced through the proper channels, so that, the general public would have equal opportunity of locating claims on the public domain in the neighborhood of the discovery.

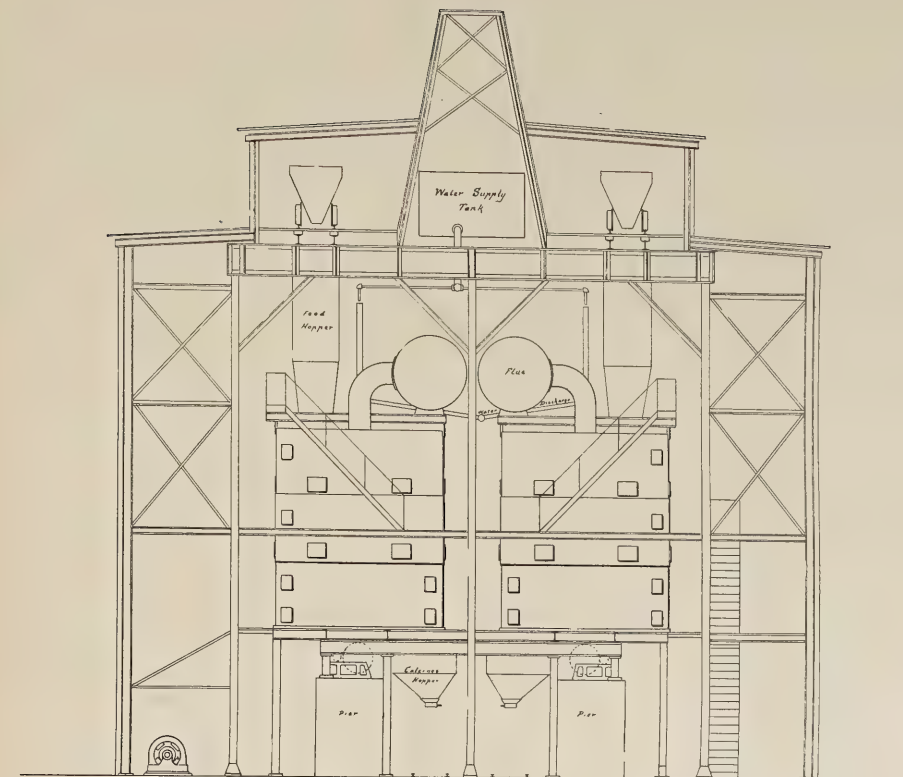
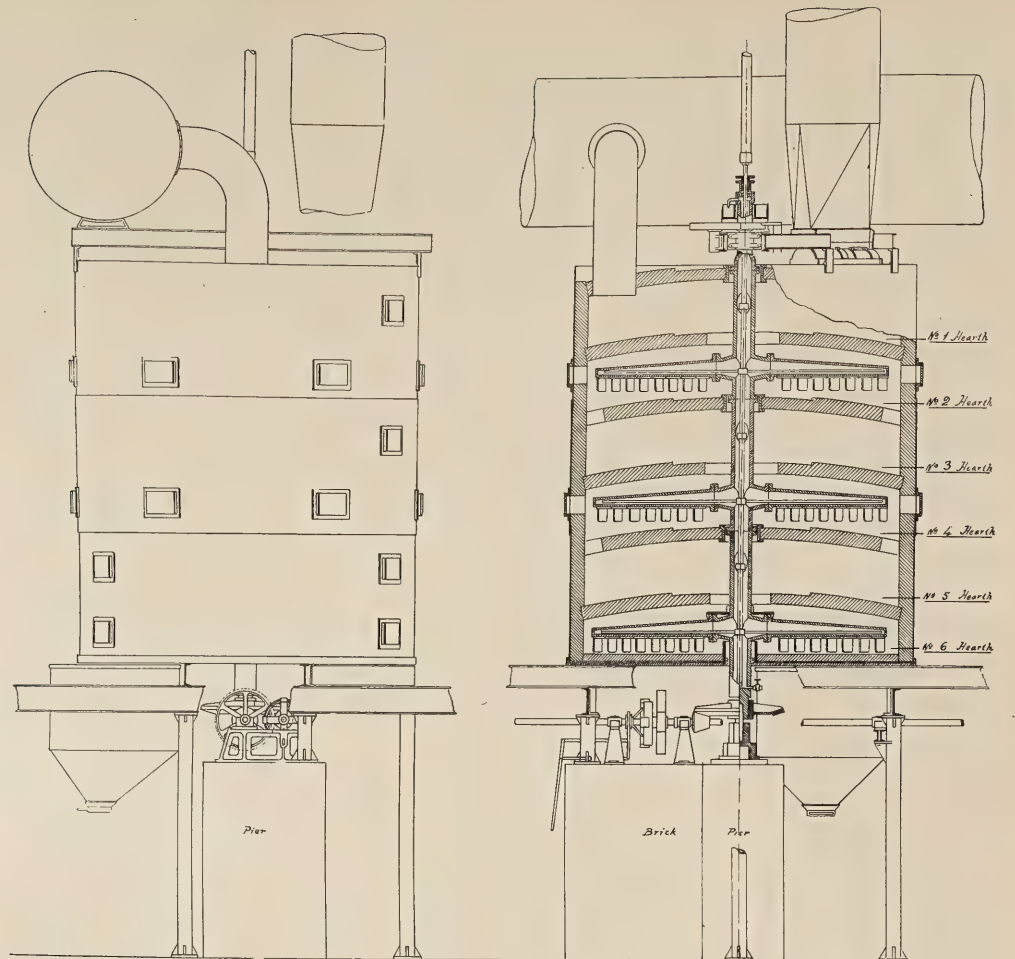
For a prospecting campaign of this kind, it would be easy for the Government to recruit abundance of volunteers from among the people of every province. As remuneration, all that would be required would be transportation expenses, board, and a small salary, with the privilege granted to each of the party of locating, say two claims, on the choice of the discoveries made each season. The fault would lie with the man himself if this opportunity to him as member of the Government Exploration Party failed to make him a fortune. Excepting the claims to be thus located by the members of the Government party no other private appropriations should be made from the Government discoveries.

They would be for the benefit of the public, or such portion of it as would interest itself in the acquisition and development of the mineral resources.

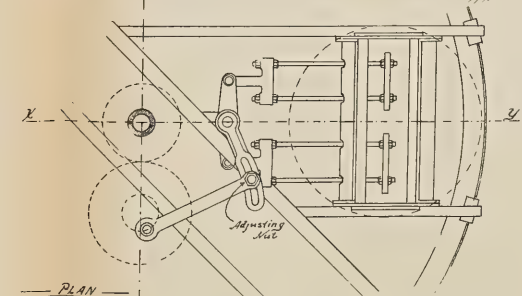
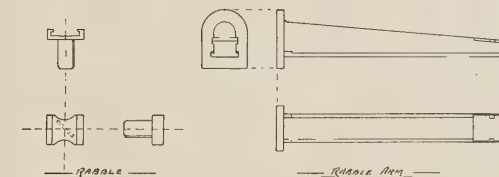
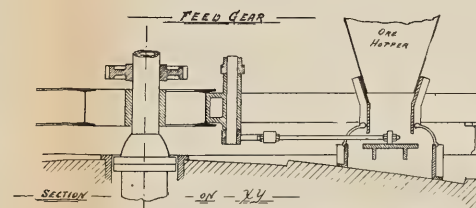
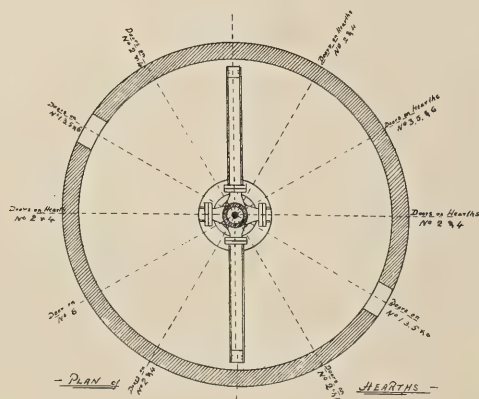
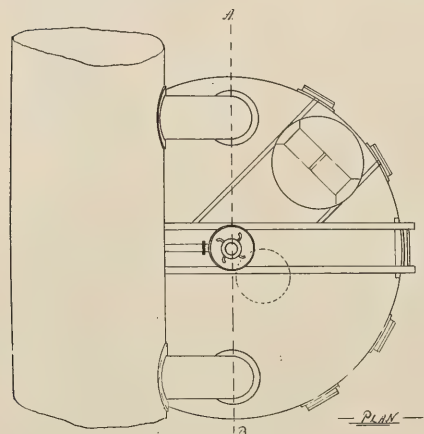
It is probable that the plan outlined for the creation of a Department of Mines and Mining in the Government and the method suggested for financing it, would meet with some opposition. This is to be expected. Any departure from the dusty precedents of the past, innovations or progressive measures of any kind are always thus assailed. However, it is believed that anyone who takes the time and patience to fairly consider the conditions and opportunities presented, will come to the conclusion that the method proposed would hurt no one, and benefit all. The results would be of great national importance, as the undertaking of the enterprise by the Government would be almost certain to inaugurate an area of permanent national prosperity.

The note issue of \$5,000,000 would be a very small strain on the credit of the Government—it amounts only to the cost of one armored cruiser.





GEN. ARRANGEMENT, END ELEVATION McDUGALL BUILDING AT HIGHLAND BOY SMELTER



MCDUGALL CALCINERS  
(Klopelko & Evans)  
AT  
HIGHLAND BOY SMELTER  
to illustrate  
"NOTES ON CONSTRUCTION & WORKING OF  
MCDUGALL ROASTING FURNACES"

by  
S. S. Sorenson  
(MEMBER)







The 10,000,000 ozs. of silver, which this issue would purchase, when coined into \$10,000,000, of subsidiary coin, would add only \$2.00 to the per capita money circulation of the Dominion, and, with the note issue, would bring it up to \$18.00, which would still be less than half what it should be.

The funds, thus placed at the credit of the newly created department, would be sufficient to finance all its operations for the five years campaign. During this time these funds would work their way into the general circulation of the Dominion, through the payments made for the labor and supplies used in the construction and equipment of the buildings proposed for the offices of the department, the salaries of the regular and special staffs, the expenses of outfitting and equipping, and the labour of the prospecting corps.

#### CONCLUSION.

The writer has endeavored, and what has already been said, to show his belief in the mining possibilities of the Canadian Rockies and has stated the reasons for the faith that is in him.

The method suggested for their exploration is the one that, to him, seems most feasible, and certain of success, and was formulated after study, for a number of years past, of different ways that might be adopted for that purpose. The method proposed may seem visionary and impracticable to some, at first sight, and while admitting that all the details of the plan for financing the undertaking are not warranted by established custom, nevertheless, there does not appear to be any good reason why it could not be adopted, as it would in no way injure the national credit.

It may be alleged that the importance of the advantages that would be gained, by carrying out the undertaking, have dwarfed all the obstacles that interpose, and, that the conclusions arrived at, were reached because the ends justified the means. If there can be any better way devised, than that proposed, the writer would be only too glad to have it adopted. But some vigorous steps should be taken for this purpose by the Dominion Government, for, the success of the mining industry, affects not merely the camp, district, or province in which the mines are located, but all parts of the country, and stands highest among all the factors in the upbuilding of the nation's prosperity. The establishment of a Department of Mines and Mining, by the Dominion Government, would be a proper recognition of the importance of this industry, which is as yet in its infancy, and it would have inspiring practical effects in attracting emigration for the development of the resources that now lie dormant and useless.

In no department of industry can Government aid and supervision be of such direct and immediate benefit. By systematic exploration of the Rocky Mountains, many areas of payable mineral will be discovered, that would otherwise, long remain unknown. The reports of the progress and results that would be accomplished by the Government exploration party would direct the efforts of thousands of prospectors; save a vast amount of labour and expenditure now devoted to useless ends and leading only to disappointment, thereby creating an erroneous impression of the mineral possibilities of this field.

The desire to increase the production of the precious metals should not be considered as a narrow, local, or selfish one. The beneficial effect of a large production of the precious metals reaches beyond the interest of the miner who mines it, the railroad that transports it, or the locality in which it is found. The success of the mining industry stimulates every other industry, aids commerce and civilization and bring general prosperity. As such, it is entitled to Government recognition and aid, for, to encourage and protect the productive industries of the people must be considered the highest type of statesmanship, under any form of Government.

That the Canadian Rockies, with an area equal to either the American or Mexican Rockies, and with geological conditions as favorable for mineral deposits, should be allowed to fall so far behind

these countries in the production of the precious metals, is not credit to the people of the Dominion.

As an excuse for any discrepancies that may be found to exist in the figures or statistics used by the writer, it should be understood that the paper was written at odd times, and mostly at places where no books of reference were available.

The figures and statistics used were taken from notes recorded over a considerable period, and from various sources, but should be approximately correct for all practical purposes.

If this paper attracts the attention that the mining possibilities of the Canadian Rockies deserve and leads to the adoption of some comprehensive plan for their systematic exploration, it will have served the object of the writer.

#### Some Notes on Roasting with McDougall-Furnace.

By S. S. SORESENSEN, Murray, Utah.

Having had occasion to give some time recently to the study of the working of a set of eight McDougall calcining furnaces at the Highland Boy Smelter, Utah, I have just put together a few notes which with the kind permission Mr. R. H. Channing, General Manager of the company, I now beg to submit to the Institute, in the hope that they may be of some interest or use to some of the members.

I am specially indebted to Mr. Channing for the valuable information and figures relating to the performance of these roasters and for his kindness in allowing me to carry out the few special tests and observations I have made in studying their working.

Though called "McDougalls" these furnaces are of improved design got out by Mr. F. Klepetko, and embraces several points covered by patents issued to Messrs. Klepetko and Evans. The Herreshoff furnaces, which are considerably advertized are of the same general arrangement though differing in important features. And there are several other variations in details affecting this type of furnace for which U. S. patents have also been issued, as for instance those of Wright and of Meech.

There being only comparatively few plants as yet at which this style of calcining furnaces has been installed and only one of these, as far as the writer is aware, in Canada, it may not be out of place if I begin with a general description of the plant at the Highland Boy smelter. The accompanying drawings are perhaps the most lucid and time-saving description to which I need only add a few words of explanation.

At the Highland Boy the furnaces are contained in a building 100 ft. x by 64 ft., and are placed in two rows of four, the rows being 21 feet apart C. to C. Longitudinally they are set at 18 ft. C. to C.

The furnaces themselves are of the vertical cylindrical type 16 ft. dia. x 18 ft high and are divided horizontally into six chambers or "floors" by means of flat brick arches having circular openings at the centre of each. Through the vertical axis of the cylinder there is a hollow built-up cast iron column or shaft to which are bolted two diametrically opposite hollow cast iron arms in each chamber. These arms are set at 90 degrees at each successive floor. Seven and eight removable cast iron rabbles or ploughs are mounted on opposite arms respectively. The central shaft extends through the bottom of the furnace and is carried by a footstep bearing above which sits the bevel gear-wheel for driving it. At the top, the shaft also extends beyond the crowning arch and is supported in a journal-box attached to steel girders which span the furnace. On the shaft above this journal is the gear-wheel which drives the feed mechanism. And above this again the annular trough which receives the circulating water discharge from nozzles in the extension of the shaft.

One of the special features of this design of furnace is the water



cooling in the central shaft and radial arms, and it is for this purpose that these are made hollow. The circulation is provided for thus. About 8 ft. of 6 inch pipe is fixed to the top of the cast iron shaft as a head or pressure pipe. This is suitably reduced down and connected with the down conduit or duct inside the column which has branches leading off independently to the end of each arm. Cold water is thus forced under the above head down to the bottom of the shaft and to the end of each arm whence it returns carrying off the superfluous heat from the castings and discharges by the nozzles before mentioned. This cooling secures the strength and endurance of the castings. It does not, however, apply to the rabbles themselves. They are not water cooled. Simplicity and cheapness and convenience in slipping on or off are the chief aims in their design. It is thought that the complications of water cooling the rabbles would outweigh the advantages to be gained thereby, whereas the rabbles as used are very readily removed or replaced.

The shell of the furnace is made of light rivetted boiler-plate, lined with 9 inch brick work.

The cast iron sectional bottom, supported on steel I-beams resting on cast iron foundation pillars, are 14 ft. above the ground level to give room for the steel hoppers for the calcines which discharge through bottom doors into the 4-ton tram cars.

The ore is run in at the top of the building, some 50 ft. above the ground level, and dumped into feed pipes 4½ ft. dia. and about 10 ft. long, which are tapered off on two sides at the lower end to fit into the rectangular mouth of the feeders. The feeding is automatic and the mechanism is a simple and efficient contrivance. Immediately below and 3 inches lower than the nearest part of the throat there is a horizontal shelf subtending the said opening. It is of the same length as the throat opening but wider. The edges thus extend beyond the angle of repose of the ore. A positive definite feed is obtained by two cross-bars or pistons mounted on horizontal rods which are given an adjustable reciprocating movement alternately pushing the ore over the farther edge of the said shelf and pulling it on its return stroke over the nearer edge. The length of this stroke determines the amount of feed and is regulated by altering the radius of the lever where it is attached to the connecting rod.

Now to trace the progress of the ore through the furnace. The position of the delivery of the ore from the feeder is near the outer circumference of the top or No. 1 Floor. The rabbles on this floor are set at an angle which causes the ore to be moved towards the centre. The opening at the centre on this floor is large affording an annular space between its inside edge and the centre column through which it falls continuously as it is pushed over by the innermost rabble. On the second floor the ploughs are set oppositely so as to move the ore from the centre to the circumference, where there are six drop-holes through which the ore drops to No. 3 floor, and so on alternately till it is discharged through two drop-holes into the calcines hoppers above referred to.

Each furnace is driven through a friction clutch affording both independence and a measure of safety in case of obstruction.

In working these furnaces on Highland Boy ore, running about 35 per cent. sulphur, no fuel is used except for warming up when starting, though on the same ore in a straight-line type of furnace, in which half the output is roasted, coal to the extent of 10 tons per diem is being used. This is due to the construction of the McDougalls:

- (1) enabling the supply of air to be closely regulated;
- (2) preventing the suction of unnecessary cold air into the furnace;
- (3) causing ALL the air required to flow against the stream of the ore so as to be progressively heated by the radiation and combustion, first from the more inert nearly roasted calcines at the bottom, up to the floor of maximum oxidation activity, above which, though then poorer in oxygen, it is still chemically able to efficiently remove the more unstable atom of sulphur, and finally, physically to carry off the moisture in the raw ore;

- (4) preventing loss by radiation, the outside surface being small relatively to the cubic contents, all of which is efficiently used while the whole of the shell is lined by not less than 9 inch brick-work; and
- (5) when once fairly started obtaining from the heated brick-work in shell and arches an excellent thermal fly-wheel.

The average duty on crushed ore is about 35 to 40 tons per diem at which rates the sulphur is reduced from about 35 per cent. to 6 to 9 per cent. respectively. The time taken for the ore to pass through the furnace proper is 2½ to 3 hours with a consequent small lock-up of the ore. There are, in fact, only from 25 to 30 tons contained in each furnace at one time (including contents of feed and calcines hoppers, using a good average depth of ore-bed on the floors for the above stated grade of calcines.)

From the above description it will be seen that there are two elements in the thorough and rapid roasting of the ore, viz., (1) the constant gentle stirring by the rabbles, the maximum speed being about 44 feet per minute, (at one revolution of shaft per minute) and, (2) the successive falls of the ore from one floor to another in fine showers through the ascending heated current of air. At the same time these falls secure a complete turning over of the ore.

I have attempted by a series of tests to determine accurately the relative effectiveness of these two agencies. The results obtained were marred by obviously faulty samples, owing to the difficulty experienced in taking samples from the centres without getting them "salted." I do not, therefore, submit the figures, but may state it as my general conclusion that the "showers" appear to be almost as effectual in oxidizing as the rabbling.

As a guide to the nature of the product dealt with, to which these remarks and figures relate, the following is the average of several sizing tests of the ore so charged.

|         |               |                 |                  |
|---------|---------------|-----------------|------------------|
| Held on | 8 inch screen | 4.0 per cent.   | } 22.5 per cent. |
| "       | 6 "           | 5.5 "           |                  |
| "       | 4 "           | 13.0 "          |                  |
| "       | 2 "           | 13.2 "          | } 29.3 per cent. |
| "       | 0.7 "         | 16.1 "          |                  |
| "       | 20 mesh       | 7.3 "           | } 48.2 per cent. |
| "       | 40 "          | 13.7 "          |                  |
| "       | 80 "          | 13.1 "          |                  |
| Through | 80 "          | 14.1 "          |                  |
|         |               | 100.0 per cent. | 100.0 per cent.  |

This product is obtained by passing all of the ore as it comes from the mine through an oscillating jaw crusher, screening through a 1½ inch hole trommel screen and passing the over-size from the latter through a pair of rolls.

The corresponding calcines sized as follows:

|         |               |                 |
|---------|---------------|-----------------|
| Held on | 4 inch screen | 16.6 per cent.  |
| "       | 0.7 "         | 19.3 "          |
| Through | 0.7 "         | 64.1 "          |
|         |               | 100.0 per cent. |

Comparing ore and calcines considerable difference is noticeable. This is the result of decrepitation and crumbling. It serves the same as finer crushing and is an aid to good roasting.

With regard to the all important question of costs Mr. Channing informs me that for the year 1902 the average total costs of roasting in the McDougalls was 34 cents per ton. This includes everything but interest on capital invested, viz, direct charges for repairs, power, supplies, tramming ore and calcines, and a proportionate share of all indirect and general expenses. The item of repairs was exceptionally heavy during last year on account of extensive alterations to the main flue leading to the common dust chamber. This makes the costs for the year abnormally high. The actual operating expenses, exclusive of such special items and general charges are more nearly 23 cents per ton.



The cost of crushing, which is not included in these figures, is about 5 cents per ton.

Two furnace-men with two helper per shift run the furnaces, and with some slight alterations in the general arrangement of the plant, which experience has indicated this number could be reduced or could be reduced or could attend to more furnaces. The principal work is keeping the drop-holes clean and barring down accretions which form on the roofs. Mr. Klepetko introduced scrapers on the top of the rabble arms, but these have not proved altogether successful. The scrapers themselves are soon cut by the crusts and then they seem to have more of a burnishing than a scraping action. They serve however to remove the softer crusts and keep the more inaccessible parts of the roof free from obstruction. These crusts consist principally of iron. They are formed by very fine particles of the iron sulphides igniting in the ascending currents of air by which they are carried up and thrown in a molten state against the roof, where they adhere. The remedy that suggests itself would be to reduce the draught or increase the area of the openings. But while the latter is unalterable for a given furnace the former can only be applied at the sacrifice of capacity. The most, then, that can be done is for the attendants to keep the drop-holes and centre holes quite clear.

The power required to drive them is small, being less than one and a half horse-power per furnace.

Repairs at the Highland Boy have been an important item of the working costs. In a large degree this has been attributable to a poor water supply which forms a heavy scale, chokes the passages and so causes trouble. Apart from the ordinary wear and tear of the driving and feed gears, which is normal, the parts most subject to renewals are the arms. These are gradually eaten away by the acid and sulphurous fumes. Parts in contact with the ore at its hottest seem to undergo a replacement action, the metallic iron being replaced by pyrite and chalcopyrite. The places where most waste occurs is between the rabblers and the arms. Moisture from the air and, on the top floors, from the ore is probably condensed on the comparatively cool surfaces of the arms and, with the acid from the gases, becomes a strong solvent and attacks the iron. Were it not for this corrosion the arms would apparently last indefinitely. The rabblers themselves form a very small item of the costs.

The circulating water at the Highland Boy has to be pumped, which adds a little to the costs. The heat carried off by this water is practically negligible being equivalent to the combustion of about 100 pounds of good coal per furnace per hour. Where water is scarce it can, of course, be cooled and used over again.

For an ore in which the sulphur is too low to maintain heat enough for its own combustion auxiliary fire-boxes can be attached and connected with one of the lower floors.

Summarising the chief points in the working of these calcining furnaces which to my mind commend them I would place them in the order of their importance:—

1st. **THEIR SIMPLICITY.** They are simple in design and simple to run. No need of expert furnace-men or "born-mechanics" to man them. Ordinarily intelligent labour with good supervision gives quite satisfactory results. There is a minimum of gearing, no elevators with their complications, no forced draughts nor fans with their dust. There are no strains from sudden or unequal expansion and contraction from alternate heating and cooling of parts. And a minimum of parts and patterns for spares need be carried.

2nd. **THEIR ECONOMY.** They are saving in fuel, labour, and in power, as well as in interest on capital locked up.

3rd. **THEIR EFFICIENCY.** They produce a good grade of calcines for the purpose required, i.e. matte smelting, viz: low sulphur, high ferrous with low ferric iron. And they do this with but little waste in flue-dust or otherwise and in quick time.

## Economic Geography.

By JAMES WHITE, F.R.G.S., Dominion Geographer.

Geography has been defined by Dr. H. R. Mill as "the science which deals with the forms of relief of the Earth's crust and with the influence which these forms exercise on the distribution of all other phenomena." Economic Geography may be defined as the compilation of the results of the study of this science whether by maps, diagrams, letter-press or by means of a commercial museum. It is evident that the wide scope of this subject debars its treatment in detail and I, therefore, propose to present a sketch of its possibilities as far as it affects our country glancing, in passing, at what has been done, what it is proposed to do and what should be done.

1. **Maps.**—The value of good maps is obvious. If our plenipotentiaries when negotiating the Treaty of Versailles had had even fair maps before them we would now own a large portion of eastern Maine and the boundary line, instead of following Pigeon and Rainy rivers to the Lake of the Woods, would have been carried up the St. Louis to the Mississippi and thence westward on about the parallel of 48°. If the British and Russian plenipotentiaries had attached accurate maps to the copies of the treaty of 1825, the boundary line would undoubtedly be shown as going up what is now known as Behm Canal, to the 56th parallel. Now that the war in South Africa is over and we know the approximate cost, it would be interesting to compare the saving in dollars and cents, that would have been effected if we had had good surveys of the theatre of operations. They would not have prevented the war but would certainly have shortened it by several months. To the miner and prospector good topographic maps are invaluable. They should show all surface features such as lakes, streams, etc., all artificial works such as railways, roads and buildings, also the relief of the surface either by contours or hachuring, preferably the former. If the rough and unsettled nature of the country prevents the topographer obtaining this detailed information he should, at least, give all possible information respecting the routes of travel.

The Department of the Interior and Geological Survey have done a great deal of map-making, the former principally in the North-West Territories and "Railway Belt" of British Columbia and in the Dominion as a whole, while the operations of the latter have extended over nearly the whole of the mainland of Canada. Other departments have published maps but as all, or nearly all of them, have been reproductions—usually on a larger or smaller scale—of those produced by the Interior or Geological Survey, they may be ignored. It is noteworthy that, with the exception of one Manitoba and a few British Columbia and Yukon maps none of these sheets show what I have emphasised as of great importance viz, relief of the surface.

While the number and accuracy of these maps—considering the methods that the topographer and geographer have, perforce, used—are worthy of all praise, there is no use shutting our eyes to the fact that undue delay in publication has occurred and is occurring and that geographical information which, if published, would be invaluable to the mining and other interests of the country, is locked up in note books and plotting sheets. No one, not conversant with the methods that the geographer in Canada is forced to adopt in compiling topographical sheets, can understand the disadvantages under which he labours, disadvantages which result in the needless expenditure of money and in loss of time while, geographically, the results are far from satisfactory. I can not do better in this connection, than quote from a memorandum by Dr. Dawson, late Director of the Geological Survey.

"The difficulty met with in the compilation of such maps arises largely from the number of sources from which information must be



sought rendering it practically impossible for the compiler of a given map—probably pressed to complete his work at a certain date—to consider, collate and familiarise himself with all. Thus, in the North-West Territories, within a comparatively limited district, surveys made under the following branches may have to be included—Topographical Surveys and Timber & Mines branches of the Department of the Interior, Geological Survey, Department of Railways, Indian Department etc. In the older provinces this is additionally complicated by surveys under Provincial Government auspices, surveys by the Public Works Department and by railway companies, charts of the coast by the Department of Marine and the Admiralty and other minor surveys not necessary to particularise. All of which have to be consulted for recent additions and changes before maps with any claim to represent the actual state of geographical information can be drawn.

The remedy for this state of affairs is admirably outlined in the recommendation of the Civil Service Commission of 1892 as follows:—

“Your Commissioners find that maps for various purposes are prepared in several Departments and, by the evidence produced, it is shown that differences frequently occur in maps of the same district when issued by more than one Department. To prevent this, and to promote accuracy and security, it is recommended that a special cartographic branch be created and that the duty of this branch of the public service should be to issue reliable maps of the various parts of the Dominion.

2. *Museum of Economic Geography*.—Although the establishment of such a bureau in Canada can not be looked for in the immediate future, a short description—summarised from an article by Mr. V. V. Branford, in the *Scottish Geographical Journal*—of a similar institution, the Philadelphia Commercial Museum, is of interest. In 1893, Dr. W. P. Wilson, now Director of the Museum, conceived the project of retaining some of the exhibits of the Chicago exhibition to form the nucleus of a permanent collection of the World's industrial projects and persuaded the city of Philadelphia to vote \$10,000 for this purpose. With this modest sum as a basis he founded an institution that covers upwards of 16 acres and has an annual income of \$200,000—\$115,000 from the municipality and \$85,000 from other sources—which has 100,000 correspondents and agents in all parts of the earth and which practically compiles a systematic catalogue of the world from the American exporter's point of view.

It has three main departments (1) The Museum proper (2) Laboratory (3) Bureau of Information.

The collections in the Museum proper are, in a general way, divided into Geographical collections where the articles are grouped according to country of origin and into Monographic collections of different varieties of the same material, of wools, cottons, minerals, oils, dye stuffs, etc. which are augmented and renewed from time to time. As the aim and object of the Museum is essentially commercial, full details as to the cost of production, wholesale and retail prices, cost of transportation, statistics of imports and exports, information respecting the financial standing of the principal firms in foreign cities etc. are furnished to subscribers.

It has also endeavoured to improve the teaching of Commercial Geography in schools and colleges by the distribution of type collections of produce accompanied by printed and pictorial descriptive matter illustrating commercial processes and products. Teachers and students can visit the Museum at regular intervals for study under the officials. The collections are open to the public; general reports and more important items of commercial news are distributed gratuitously and it also answers, without charge, the thousands of domestic and foreign letters of enquiry. For \$100.00 a year it also gives a regular

service of information respecting current commercial events, the world over.

In the Laboratory, chemistry and the microscope are utilised to determine the amount of cotton in “all wool” goods, of copper in an ore etc.

The principal sources of information are as follows:—

(1) Trade journals of various countries, some fifteen hundred in number, from which the principal facts are culled and indexed by the card system, any matter calling for immediate attention being brought to the notice of the manufacturers interested therein.

(2) Consular and other official reports of the United States and foreign governments which are treated in the same way as the trade journals. As the results of reporting to the Museum are manifest, it is said jestingly, that American consuls sometimes report to Philadelphia and ignore Washington.

(3) Special representatives who study trade conditions in foreign countries in the interests of American exporters and endeavour to bring foreign governments and dealers into touch with the Museum.

3. *Economic Atlas*.—The Department of the Interior proposes to undertake, as soon as the results of the last Census are available, an Economic Atlas on much the same lines as the Atlas published by Finland—a unique publication, no other country in the world having attempted anything as comprehensive as the Finnish work. As the necessary information is not available we will not be able to undertake anything as detailed or elaborate as the Finnish atlas but do propose to present a diagrammatic summary of the domestic material assets of our country. It will include:—

(a) Topographical map of Canada on a scale of 35 miles to the inch showing the principal mineral occurrences, forest, agricultural and dairy resources.

(b) Geological map of Canada—scale 100 miles to the inch.

(c) Hypsometric map showing elevation of land surface.

(d) Map showing telephone and telegraph lines and canals, with statistics of mileage of telephone and telegraph lines and of tonnage of freight and vessels through, size of locks, depth on sill, length etc. of canals.

(e) Meteorologic maps showing isotherms and isobars for months and year, snowfall and rainfall.

(f) Map showing limits of trees, shrubs, cereals and general culture.

(g) Diagrams illustrating population statistics, for census years, of number, density, proportion of sexes, population according to age, sex, urban and rural, civil state (married, unmarried, widows, widowers, and divorced); degree of education, vital statistics and population by profession and origin; financial, as revenue, expenditure, exports and imports—with special diagrams for principal articles of production and export—and trade per head as compared with other countries; diagrams illustrating growth of industries which have made great advances as mining, manufactories and agriculture; navigation, tonnage, freight, number of passengers carried and vessels entered at principal ports.

It is desirable that a water-power map be included but the available information is of too fragmentary a nature to justify the attempt. In the Finland atlas the position of the falls and rapids is indicated by a red line the length of which is proportional to the fall and by a green circle of area proportional to the horse-power. The importance of the miner and manufacturer of data relating to the discharge and fall of streams can hardly be overestimated. Many thousands of dollars wasted in installing plants where sufficient power is not available might have been saved if the necessary information had been obtainable. In addition to the commoner uses for water-power its use in connection with the production of electricity for electro-chemical processes is of



DOMINION COAL COMPANY.



Bank-head Dominion No. 1. Colliery where the recent fire took place and which is now being flooded.



The Reserve Colliery of the Dominion Coal Co. where several men lost their lives this month by an explosion.



increasing importance. In coal-less provinces, like Ontario and Quebec, we must look for its substitute to the innumerable streams that descend in a series of rapids and falls from the great Archaean plateau that forms the northern portion of their area and which carries what is, probably, the greatest spruce forest in the world. The value of water-power will undoubtedly be much greater in the future than in the past, and will determine the localisation of great manufacturing centres. As the water supply depends entirely upon the rainfall it is evident that a study of the latter in connection with the hypsometry of the country will be of great importance and in this connection additional meteorological observers will be required in the more thinly-settled districts.

When in Washington last fall, I investigated the methods used by the hydrographer, Mr. Newell, and found that he has succeeded in securing a maximum of result at a minimum of cost. For instance, on the smaller streams if there is no suitable log in place, a tree is felled—usually near a road bridge—with one end in the water and the other on the bank, a flat surface cut on one side and divided into a scale that represents feet and tenths of vertical height. As the logs lie at a considerable angle with the vertical, the divisions are some distance apart which renders it easy for unskilled observers to read. Daily readings are taken by an observer—usually a store-keeper or farmer who lives in the vicinity, or a school teacher whose route leads past the observing station. The observer receives \$35.00 to \$60.00 a year and, once a month, fills in the results on cards supplied for the purpose, which are then mailed to Washington. When establishing the station the stream is cross-sectioned and the velocity measured with a current meter. With this data and with additional measurements of velocity taken at different stages of the water, the discharge can be readily calculated. For large streams gauges of a more expensive and more elaborate pattern are used.

Hypsometric maps are valuable as the form of the land determines the direction and strength of the winds that blows over it and the abundant rainfall, or lack of it, in any district, is the direct result of the guiding action of the elevations and depressions of the surface. Professor Saunders of the Experimental Farm informs me that in the North West he finds the matter of altitude has much influence—sometimes more than latitude—in regard to the trees and shrubs under trial.

Diagrams showing population and other statistics gathered from the Census, Trade and Navigation and other reports will show at a glance the distribution of every condition that is dealt with and enable the reader to follow, decade by decade, the progressive development of the country and to study for each census the relation between the various conditions.

Among the points that will be specially emphasised in the Economic Atlas are:—The immense mineral wealth, as the coal-fields of the Maritime Provinces, the North West Territories and British Columbia, the gold-fields of Nova Scotia, British Columbia and Yukon, the asbestos of Quebec, nickel of Ontario, silver, lead and copper of British Columbia, etc.; that our mineral production has increased from \$13,221,225 in 1886 to close upon \$70,000,000 in 1902; that comparing on the basis of population, our external trade is \$13 per head, three times that of the United States; our exports of manufactures, one and a half times as great; that we have more miles of railway per head, then any other country in the world and stand eighth as regards total mileage; that, in the last ten years, our trade has increased faster than that of any other country, viz 90%; that, in the same time, the balance of trade against us—the excess of imports over exports—has decreased from upwards of 8½ millions to less than half a million, and the assets of our chartered banks, have increased from 292 millions to 625

millions; that—to take one item of dairy products in which we have made great advances—our exports of cheese increased from 49 million pounds in 1881 to 196 millions in 1901, while in the same period the exports of the United States decreased from 148 millions to 40 millions; that barley, oats, wheat, and all hardy vegetables have been grown at Dawson, only 150 miles from the Arctic Circles; that the total imports of wheat into Great Britain aggregate 160 millions while our surplus for exportation was 10 millions in 1900, 30½ millions in 1902, and in a few years will be sufficient for the needs of the mother country, thus making Canada truly “the granary of the Empire.”

At first sight, the great development of the arable land in our North West may appear to have comparatively little effect on mining, and to be of comparatively little interest to mining engineers, except as patriotic Canadians, but settlement brings railways with greatly increased facilities for the transportation of mining supplies, and of the product of the mine, while the mines furnish a valuable local market for the farmer and stock raiser.

At the present time three railways, the Canadian Northern, Grand Trunk Pacific, and Trans-Canada are either actually under construction or have engineers in the field locating transcontinental roads that will cross the mountains by, probably, the Yellowhead, Pine and Peace River passes, all very much lower than any pass traversed by similar lines in the United States. The Yellowhead Pass line will, in all probability, traverse the Cariboo country. What this means is best illustrated by the remarks of Mr. Hobson, Manager of the Consolidated Cariboo Hydraulic Mining Company, at a recent meeting of the Mining Association of British Columbia. He said, “During the time we have been engaged on construction work we have used as high as 150,000 lbs. of oats, 160,000 lbs. of hay, and 60,000 lbs. of beef. This is the farm produce consumed by one mine. Now, gentlemen, what would two or three hundred such mines do for the farmer? We have made expenditures in cash of from \$60,000 to \$70,000 annually for miners’ wages; \$25,000 to 35,000 for teamsters for hauling provisions from Ashcroft to the mines, and even as high as \$50,000 during the progress of development work; \$30,000 to \$60,000 has been expended annually in Victoria and Vancouver for miscellaneous stores and provisions, including hardware. In addition to the above we consume annually explosives costing from \$30,000 to \$50,000—all purchased from Victoria manufacturers.

Every pound of goods that we get delivered at the Consolidated Cariboo Hydraulic mine is drawn a distance of two hundred miles and costs 5 cents, or \$100 a ton. We of course suffer for lack of railway transportation facilities; but I think transportation facilities will eventually come. The mountain regions lying to the east of the Cariboo and Horsefly districts are now known to contain extensive bodies of argentiferous galena and copper ores, the same as you have in the Kootenay and Slocan country. Railway transportation facilities are required to encourage and hasten the development of the mineral industry of the Province, and railways will no doubt be built as soon as it is known that business will warrant their construction.”

We are on the eve of the greatest period of expansion and development that the world has ever seen; 25,000 Americans crossed the border last year, and 50,000 will cross this year despite the endeavours of agents of United States railways and land companies; the tide of European immigration that has hitherto poured into the great republic to the south of us will now undoubtedly turn Canada-wards and the marvellous development of the American West and the North-West will be duplicated in our Territories. In the United States, the territory of Oklahoma increased from 78,000 in 1891, to 398,000 in 1901, and we have room in our southern territories alone, for nine Oklahamas.



In conclusion I wish to enter a mild protest against the popular idea that a geographer is a map-maker and nothing more. A proper conception of his functions is admirably outlined by Dr. A. J. Herbertson in his paper on "Geography in the University." (Scottish Geographical Journal for March, 1902).

'A geographer is at once a patriot and an internationalist, keenly alive to the necessity of stimulating the full development of local activity and resources, yet world-wide in his outlook and sympathies. The one is essential to the other, for each part of the World is now so closely linked to every other part, that healthy progress in one is favourable for all. The geographer is a student of the world of peace as well as of the theatre of war—the exponent of the environment to be dealt with in any venture, commercial or military, political or missionary. He must have time to travel, and in return, the fruits of his observations and his thoughts should be given to his pupils and to the world. It seems to the writer that one of the most important duties of the geographer is to show forth sympathetically the conditions of other countries to the younger generation in the university, and on occasions to the public, and thus help to remove prejudice and foster good feeling which is so essential for the rapid harmonious development of this complex world in the twentieth century.'

### Mineral Production, Canada and United States.

By GEORGE JOHNSON, Dominion Statistician, Ottawa.

The statistics of mineral production in Canada and the United States for 1901, having been published we have the means of comparing the development of the two countries in the production of mineral wealth.

Both countries classify their mineral production into metallic, non-metallic and miscellaneous, though the officials of the Geological Surveys in both countries differ in their assignments, according to the proverbial saying about our good friends the doctors of medicine.

Let us re-arrange our Canadian list so as to make it correspond with that of the United States Geological Survey, not because the distribution of the Washington savants is any better than the one devised by our own wise men, but simply because there are fewer changes in the selected re-adjustment than would try our patience if we adopted the alternative.

In the general division of metallic, non-metallic and miscellaneous, the value of the production of each country in 1901 was:

|                  | Metallic.     | Non-metallic. | Miscellaneous. | Total.          |
|------------------|---------------|---------------|----------------|-----------------|
| United States... | \$524,873,284 | \$566,351,996 | \$1,000,000    | \$1,092,224,380 |
| Canada .....     | 42,309,202    | 24,103,506    | 300,000        | 66,712,703      |

The first fact that presents itself is the comparative smallness of the Canadian output, just about one-sixteenth of that of the United States. Taken on a per capita basis the United States produce \$14.12 per head of their population, and we \$12.42, a difference of \$1.70 per head. Put in this way the difference does not appear to be so unpleasantly great. Still we do not produce as much per head as our neighbours, although we have as great an area of country and are equally well endowed with mineral wealth. It is some consolation that we are catching up. In 1900 we were short \$1.97 per head. This is reduced in 1901 to \$1.70. If we make the same relative increase we would produce the same per head value as the United States by 1908. Canada was \$6 per head behind in 1891 and only \$1.70 behind in 1901. The United States increased its per head output in 1901 as compared with 1891 by \$4.20 and Canada its by \$8.50.

The first column in the above table shows the value of the metallic production of the two countries. This includes antimony, copper,

gold, pig iron, lead, mercury, nickel, platinum, silver and zinc and the same in the United States with the addition of quicksilver and aluminum for the latter country.

In the United States this metallic production forms 48.05 per cent. of their whole mineral production while in the case of Canada it forms 63.42 per cent.

In every \$100 of mineral wealth produced in the United States \$48.05 comes from metallic sources and \$51.95 from non-metallic and miscellaneous.

In Canada in every \$100 produced, \$63.42 comes from metallic and \$36.58 from non-metallic and miscellaneous.

This was not always the case in Canada, for in 1891 Canada's metallic production was only \$29 in every \$100.

In 1891 the output of Canada had to be multiplied by 55 to bring it up to the output of the United States, but in 1901, 12½ would be the multiplier, and to that extent Canada has decreased the distance between herself and her big neighbour in respect to metal production. Canada was 55 miles in 1891, and in 1901 she was only 12½ miles, in the rear, at which rate it will not take her long to catch up and pass.

Notwithstanding the large increase in production in the United States—in 1891-1901 over 224 million dollars—Canada has gained upon her neighbour to the extent indicated.

The increase has been, therefore, more emphatic in Canada than in the United States, marked as the development has been in the latter country.

In the United States by far the largest part of the increase is due to the enlarged production of pig iron. In 1891 the production was 8,279,870 tons, and in 1901, 15,878,354 tons, an increase, taking values, of 88 per cent. against a general increase of 64 per cent. in the other articles belonging to the metallic class.

Canada made no such progress in the same period. In 1891 she made \$368,901 worth of pig iron, and in 1901, \$1,212,113. Relatively this is a greater development than that of the United States; but \$46 in every \$100 worth of the metal production of the United States was derived from the furnaces which melted the iron ore, while in Canada not more than \$2.80 was due to the production of iron.

The equipment of iron and steel works and the encouragement given by the Government in the shape of bounties has resulted in a great development of the production of iron, but the development does not show in the year under review, which is the latest for which the statistics of the two countries are supplied.

In Canada in 1901 very much the largest part of the increase is due to the greater production of gold. In 1891 the gold produced was valued at \$930,614 and in 1901 at \$24,128,503. In the case of Canada this was 57 per cent. (in 1901) of the total metallic production. In the United States in the same year the gold produced was about 15 per cent. of the total production of metallic substances.

As already stated the United States returns include most of our articles and in addition quicksilver and aluminum, while we have nickel, which appears in the United States returns in very small quantity, if it has any right there at all.

Of aluminum we could produce immense quantities, for we have the material in abundance.

Seemingly we do not need it in sufficient quantities to make it worth while to provide ourselves, and we, therefore, import about \$16,000 a year, \$8,700 of which is in ingots and the remainder in manufactured forms. The world produces about 6,700 short tons of the value of \$3,590,000, and of that the United States has a production valued at \$1,920,000, or more than one half.



Of quicksilver the world's production is about 3,470 tons, about one thousand tons of which come from the United States. Spain and the United States producing about the same quantity. California is the great quicksilver State.

Of tin neither country produces a pound. Canada may have it, but it has not been found. There is a good deal of it needed for the world's uses and whoever succeeds in discovering it in Canada may count upon a fortune following the find. In the meantime we import in various forms about \$2,500,000 of tin annually.

Reference has been made to gold and iron as two of the most important of our metals.

The production of gold increased every year for a long time, till 1901, when there was a drop in the quantity.

In 1892 the value was \$907,600; in 1893, \$976,600; in 1894, \$1,128,690; in 1895, \$2,083,700; in 1896, \$2,755,000; in 1897, \$6,027,000; in 1898, \$13,775,420; in 1899, \$21,261,584; in 1900, \$27,908,153, and in 1901, \$24,128,503.

The development of the production of gold is of course, primarily due to the discovery of the metal in the Yukon Territory.

Altogether from all sources, Canada has added to the world's store of the yellow metal \$160,879,000, of which \$70,000,000 or \$43 in every \$100 have come from the Yukon Territory and practically all of it since 1897.

The production of gold, however, has been developed in other parts of the country. In 1891 the yield of gold in Canada, exclusive of the Yukon, was under \$900,000, and in 1901 it was (without the Yukon's contribution) \$6,130,000, or a gain of \$5,230,000.

In the United States the production of copper stands next in value to pig iron. Its value in 1901 is \$6,400,000 more than the value of the gold yield of that year and amounted to \$86,630,000. This is over \$11,000,000 less than in 1900. The production of copper in Canada in 1901 was \$6,097,000, a gain of over \$3,000,000 in 1901 as compared with the previous year, and of \$4,947,000 as compared with 1891.

Of course in the production of nickel Canada surpasses the United States and all other countries. The chief producers of the world are Canada, Germany and France, in all in the neighbourhood of \$7,750,000, of which Canada produces \$4,600,000. The nickel produced in the United States was under \$4,000 in 1901.

The non-metallic division of both Canada and the United States includes fuels, structural material, abrasive materials, chemical materials, pigments and miscellaneous.

Fuels include coal, natural gas and petroleum. Of these in 1901 the United States produced a value of \$442,190,754, an increase of 86.5 per cent. over the production of 1891. In 1901 Canada produced \$14,581,540 worth, an increase of 78 per cent. on the value of the production of 1891. The production of the United States in 1892 was 30 times more than that of Canada, and in 1901 it was about the same, Canada holding her own.

In 1868 Great Britain produced 115,500,000 tons of coal and the United States 31,500,000 tons. In 1878 the production was: Great Britain, 148,500,000 tons; United States, 57,800,000 tons; 1888, Great Britain, 190,500,000 tons; United States, 148,500,000; 1898, Great Britain, 226,333,000 tons; United States, 219,900,000 tons.

In 1900 the United States for the first time had a greater production; the figures being, Great Britain, 252,000,000 tons, United States, 269,700,000 tons; still further increased in 1901, when the United States production reached 293,300,000 tons, against Great Britain's 245,300,000 tons.

In 1868 the British Isles' production was 36 times that of the United States, and in 30 years (1898) the United States produced within 7,000,000 tons of Great Britain's production.

We have the coal. The demand for it is increasing, and there is no reason why Canada should not be one of the greatest of the world's coal producing countries.

In structural material such as stone, tiles, clay for brick, cement, the United States produced \$85,202,715 in 1901, an increase of \$15,597,789 over 1900. Canada obtained from her own resources \$6,803,756 worth in 1901, as against \$6,372,901 worth in 1900. Canada's increase is about 7 per cent.; the United States increase is over 22 per cent.

Among these articles is cement of which Canada uses about 1,100,000 barrels a year. The quantity produced in Canada was 500,000 barrels, the remainder being imported. There has been great expansion in this industry in Canada, and undoubtedly in the near future the demand which is likely to be greatly increased will be supplied from home resources.

Chemical materials include borax, bromine, fluorspar, gypsum, marls, phosphate rock, pyrites, salt and sulphur, according to the United States list. Of these our Geological Survey takes cognizance for statistical purposes of gypsum, phosphates, pyrites and salt.

The production in Canada of phosphates is very small. From 31,700 tons in 1890 it has gone down to 1,033 tons in 1901.

The production in the United States in 1901 was nearly 1,250,000 tons, which is an increase over 1891 of 895,000 tons, though between those dates the quantity produced was in many years equal to that of last year.

The exports to the United Kingdom by the United States of phosphates to the value of over half a million dollars in 1901 shows that there is still a market for American phosphates, but there is none for Canadian phosphates. We have abundance. Why did we not hold what trade we had? The reason must be known. Is there anything to be done that will restore this phosphate industry to its former position or must we resign ourselves to abandonment of the business altogether? Seemingly this point will bear investigation. Possibly the application of electricity in the production of phosphorus would give an impetus to the business.

Of sulphur we do not appear to produce any quantity as yet. There was a statement that the companies at Sault Ste Marie, Ontario, intended to make it from the pyrrhotite ore of Sudbury for use in the manufacture of sulphite pulp for paper making, but the statistical returns do not yet show record in this respect.

Among miscellaneous material may be mentioned asbestos of which we produced in 1901, 40,217 tons valued at \$1,259,759. Of this article the United States produced 747 tons valued at \$13,498.

Canada is a maker of arsenic to the value of \$41,676, an increase \$18,951 over the previous year. It is produced as a by-product of the gold milling operations by the Canadian Gold Field's Co.

In a general way during the five years 1897-1901 we produced \$248,160,323 of articles classed under the heading of mineral production, and we exported in the same period \$104,078,270 leaving, for home use about \$144,000,000.

In the five year period 1890-94, we produced \$2,334,626 and exported \$27,677,270 leaving \$54,657,356 for our home use.

This would show an increase of 122 per cent. in our utilization of our mineral production.

Of course, considerable of the increase in production is due to the very great development of our gold production. In 1897-1901 we



produced gold valued at \$93,100,676 against a production in 1890-94 of \$5,093,282.

It will be instructive to see how we stand if we eliminate the gold from the exports. The exports of 1897-1901 would then be \$55,819,815 leaving minerals to the value of \$192,340,608 to represent home used. The exports of 1890-94 would be \$25,583,819 leaving \$66,780,807 to represent home used. This shows an increase of 188 per cent. in our utilization of our mineral production and points to a very great development in the home industries which depend upon the mineral output. It also shows that in various forms and ways we utilize more and more the gold supply of the country within the country instead of exporting it.

Thus in 1890-94 we retained \$3,000,000 of our gold product and exported \$2,093,000, making a total output of \$5,093,000.

In 1897-1901 we retained \$44,842,221 and exported \$42,258,455 making a total output of \$93,100,676.

A wide field of usefulness is offered for many of the minor metals in connection with the electrical furnace. The manufacture of carborundum and calcium carbide in the electro-chemical industries, of aluminium, of sodium, of zinc, of manganese and phosphorus by electrical process, has already attained considerable proportions in Canada without the results appearing in the returns of the Geological Survey.

### Mining in Newfoundland.

By MR. J. P. HOWLEY, F.P.S., St. John, Nfld.\*

The total value of the mineral products for the calendar year 1902, according to the figures now in my possession, amounted to the sum of \$1,217,686, which, in comparison with that of the preceding year, shows an increase of \$6,395. In reality, however, the increase is somewhat more, as I find I was misinformed as to the value of pyrites shipped in 1901, which was less by \$8,891 than the figures given in that year's report, so that the actual increase was \$15,286. This result is very satisfactory, considering the poor market conditions that prevailed, principally owing to the great depreciation in the price of metallic copper, which fell from 16 to 12 cents per lb., making a difference in the value of the copper output alone of \$94,284.

It is true that there was a falling off in the actual amounts of both copper and iron ore shipped during the year. In the former case it was less by 740 tons, and in the latter by 9,485 tons, representing a money value of \$11,335. This would have been amply compensated for by the increase in other directions, the value of the slate alone having nearly doubled, while that of pyrites more than quadrupled the preceding year's output.

The decrease in shipments of iron ore from Bell Island was unexpected, and may be accounted for from the fact that the Dominion Steel Co. did not send any of their ore to foreign markets last year. All they mined was sent to their own reducing works at Sydney, C.B.; consequently their shipments fell off by 92,995 tons. On the other hand, the Nova Scotia Co. increased their output by 87,074 tons.

So far from the mining industry as a whole showing any decadence, at no time in its history was it in a more flourishing condition, several new features having been imported into it during the past year. A lively interest was displayed in the prospecting for minerals, and new and important discoveries were the outcome. Some properties have been taken up by capitalists who are preparing the way for active development, while one or two abandoned mines have been re opened, which promise to become considerable producers in the near future. Pilley's Island pyrites mine, upon which work was suspended a few

years ago, is now under its new management, coming again to the front, its output last year nearly equalling some of its best production. The same company have taken over the old Terra Nova mine at Bay Verte, lying dormant for over forty years, and during the season raised some 3,500 tons of cupriferous pyrites, 350 tons of which was shipped to the United States market.

The pyrites property at Rowsell's Harbor, Labrador, was visited and examined by an expert last autumn, and it is brought the Dominion Steel Co. will commence work upon it during the coming summer.

The York Harbor copper mine, Bay of Islands, has passed into the hands of a strong syndicate, who purchased it not long since. Mr. C. E. Willis, the new manager, is pushing development work during the winter, and this mine bids fair to add considerably to the copper production of the future.

There has not been much done to exploit our valuable chromite deposits as yet, but Mr. Willis, of York Harbor, has had a route surveyed for a tramway to connect the chromite mine, near Benoit's Brook, with the railway at George's Pond. His company intend constructing this branch during the coming summer, to enable them to bring out the ore to a convenient shipping point at Bay of Islands.

Last year witnessed the first shipment of barytes from the country. It was sent to the U. S. market, where, I understand, it sold at a fair margin of profit, and was considered a good quality of ore.

Our brick and slate industries made a decided advance and showed a marked increase in value over the figures of the preceding year. Both are likely to figure prominently in the future. No returns are forthcoming from the slate quarry at Summerside, Bay of Islands. It is not probable any shipments were made, as there is usually a great deal of preliminary work in clearing away the surface debris in such undertakings before the actual manufacturing of slate can be entered upon. Messrs Mitchell and Campbell have optioned their slate property at St. Jones, Trinity Bay, to an English company who will probably begin operations upon it as soon as Spring opens.

Perhaps the most noteworthy feature of the mining industry for the year was the actual commencement of gold quartz mining. The prognostications of several years passed are apparently at length about to be realised. There are now two gold mines in operation in the Island: one at Rose Blanche, on the southern seaboard, and another at Sopp's Arm, in White Bay. As yet mining for the precious metal in either locality is in its first stages. No stamp mills have been so far erected to treat the ores, though they have been purchased and will be placed on the ground early the coming season. I have no particulars of what has been done in the way of development in the former locality, but in the latter some thirty men are engaged sinking on the lead and clearing away the surface. Having visited and examined this property during the past summer I am in a position to state that the prospects here are of a most encouraging nature, particulars of which will be found in my geological report of the district.

The discovery of free gold at this place by Mr. A. Stewart, M.E., gave a stimulus to the search for the precious metal, with the result that several rich specimens have been brought to light. It looks as though a gold mining development of no mean order will become an established industry ere long. That the country would eventually prove auriferous, no person who understood its geological features could doubt.

A use has been found for the peculiar substance agalmatolite, as a paper filler, and for enamelling purposes, and a company has recently purchased the property near Manuels, on the south side of Conception Bay, which they are opening up.

The quarrying of granite and other stone to be used in the construction of the new Court House and Railway Station, as well as for

\*Annual Report to the Minister of Agriculture and Mines.



foundation walls and street paving was actively pursued, but it is not easy to get at the full particulars of this industry.

The boring operations for petroleum at Parson's Pond resulted somewhat more favorably than in previous years. One hole was put down to a depth of 2,160 feet when oil was struck in fairly good quantity and of very superior quality. This oil appears to come from a lower set of petroliferous strata not hitherto pierced by the boring drill. It possesses the property of burning freely in its crude state without undergoing any process of refining, giving off but little smoke or offensive smell and is apparently free from explosive gas. The well has not yet been torpedoed, but I learn that eighteen barrels were pumped therefrom without greatly diminishing the quantity present. So far the company has put down five holes all of which have yielded oil, and although the quantity has not been great, still the fact that no dry holes have been encountered is very encouraging. The company are now contemplating the erection of a refinery upon the ground to treat the crude product themselves, and they certainly deserve every encouragement in their enterprise.

The great interest of late manifested in mining, and the search for minerals, can scarcely fail to bring many properties into the productive stage ere long. It is safe to predict, should the market remain firm, that the coming year will witness a largely increased output all around, more especially should the Bond-Hay Treaty become a *fait accompli*.

An attempt has been made to ascertain the number of persons employed in the mining industry during the year; number of accidents and deaths caused by same, with the following result:

|                         | No Employment. | Accidents. | Fatalities. |
|-------------------------|----------------|------------|-------------|
| Iron mining             | 791            | 19         | 4           |
| Copper mining           | 448            | 3          | 1           |
| Pyrites mining          | 225            | 2          | 1           |
| Quarrying granite, etc. | 108            |            |             |
| do slate                | 90             |            |             |
| Brick making            | 44             |            |             |
| Gold mining             | 30             |            |             |
| Miscellaneous           | 64             |            |             |
|                         | <u>1,800</u>   | <u>24</u>  | <u>6</u>    |

It will be seen from the above figures that the occupation of the miner is not at all so hazardous as is generally supposed, and will bear a favorable comparison in this respect with any other of the country's industries. The percentages of accidents and fatalities represented above indicate for the former 13 per cent., and for the latter, 3 per cent. In the preceding year, 1901, it was much less, there being only two fatalities in seventeen accidents, or 1 per cent. of the number employed.

I am again indebted to the managers of the various mines for the greater part of the information contained in this report, as well as to several individuals more or less interested in mining enterprises, all of whom, with very few exceptions, have willingly filled in and returned the forms sent them.

I may here state that the publication of these annual mining statistics is drawing considerable attention from outside to our valuable mineral resources, and constant applications are being received for copies. The statistical Department of the Home Office, London, and the publishers of the "Mineral Industry," New York, regularly quote my figures of late years.

The latter publication has perhaps the widest circulation amongst mining people, all over the world, of any work devoted to this industry.

The subjoined tables represent the chief features of the mining industry for the year.

TABLE I.  
Mineral Production of Newfoundland for the Calendar Year 1902.

| Product.       | Quantity raised | Manufactur'd or used in the country. | Exported to what market.                                          | Values of ores at mine |
|----------------|-----------------|--------------------------------------|-------------------------------------------------------------------|------------------------|
| Barytes        | 315 tons        |                                      | United States                                                     | \$ 630                 |
| Brick          | 1,625,000 M.    | 1,625,000 M.                         |                                                                   | 18,950                 |
| Building Stone | 5,000 tons      | 5,000 tons                           |                                                                   | 6,000                  |
| Cobble Stone   | 500 tons        | 500 tons                             |                                                                   | 500                    |
| Copper Ore     | 74,608 tons     |                                      | 35,947 Eng }<br>35,538 U.S. }                                     | 265,810                |
| Granite        | 2,955 tons      | 2,955 tons                           |                                                                   | 17,730                 |
| Iron Ore       | 728,721 tons    |                                      | 107,189 Eng }<br>204,720 Ger }<br>328,038 N.S. }<br>81,920 U.S. } | 728,721                |
| Limestone      | 1,150 tons      | 3,100 bus.                           |                                                                   | 345                    |
| Paving Stone   | 2,250 tons      | 180,000 bks.                         |                                                                   | 18,000                 |
| Pyrites        | 26,000 tons     |                                      | 26,000 U.S.                                                       | 117,000                |
| Slate          | 3,500 tons      | 11,000 sq.s.                         | 3,500 G. Br.                                                      | 41,000                 |
| Total          |                 |                                      |                                                                   | \$ 1,217,686           |

TABLE II.  
Showing Increase and Decrease in Comparison with Preceding Year's Output.

| Product.       | Quantity.   |            | Value.       |              |
|----------------|-------------|------------|--------------|--------------|
|                | Increase.   | Decrease.  | Increase.    | Decrease.    |
| Barytes        | 315 tons    |            | \$ 630       |              |
| Brick          | 320,000 M.  |            | 5,900        |              |
| Building Stone |             |            | 1,000        |              |
| Copper Ore     |             | 740 tons   |              | 94,284 00    |
| Granite        |             | 285 tons   |              | 1,980        |
| Iron Ore       |             | 9 485 tons |              | 9,485        |
| Limestone      |             | 150 tons   |              | 630          |
| Paving Stone   | 40,000 blk. |            | 3,872        |              |
| Pyrites        | 19,725      |            | 88,763       |              |
| Slate          | 1,500       |            | 21,500       |              |
| Total          |             |            | \$121,665 00 | \$106,379 00 |

These tables point conclusively to a steady upward tendency of this important industry. This year's output indicates a *per capita* value of \$5.61, while it represents an average earning power of \$676.49 for the number actually engaged, being far in excess of either the fishery or lumbering industries.

The proportionate value of the several mineral products to the whole amount will show the relative standing of each individual product during the year:

|                |                  |
|----------------|------------------|
| Iron Ore       | 59.844 per cent. |
| Copper         | 21.829 "         |
| Pyrites        | 9.608 "          |
| Slate          | 3.613 "          |
| Brick          | 1.556 "          |
| Paving Stone   | 1.478 "          |
| Granite        | 1.456 "          |
| Building Stone | .492 "           |

Gold is not included in any of the above calculations for the reason that the figures are not available. Basing the estimate on former results, and upon such other information as was ascertained some few years ago, *i.e.*, about two ounces per ton of metallic copper, last year's output should yield about 4,760 ounces fine gold. To be well within the mark it may be assumed at 4,000 ounces, worth \$82,680.00. These figures, even if approximately correct, would materially increase the total value and add much to the *per capita* and other percentages given above.

**New Gold Fields of British Columbia.**—The profit and loss account shows a gross profit of £2,241 5s. 4d., expenditure £2,233 16s. 10d., leaving a net profit for the year of £7 8s. 6d. This balance, together with the amount brought forward from last account, *viz.*, £2,240 18s. 3d., gives a total credit balance of £2,248 6s. 9d., from which has been deducted £549 5s. 3d., for income tax, leaving a net credit balance at date of £1,699 1s. 6d., which with the reserve of £5,000 shewn in last year's balance sheet, amounts to £6,699 1s. 6d.



## COMPANY NOTES.

**Granby Consolidated**—The Boston Stock Exchange has placed on the regular list the issued stock of the Granby Consolidated Mining, Smelting & Power Co., Ltd., amounting to 1,336,303 shares out of an authorized capital of 1,500,000 shares.

Condensed balance sheet as of Jan. 31, 1903, is as follows:—

| ASSETS.                            |              |
|------------------------------------|--------------|
| 338 acres mineral claims .....     | \$12,674,506 |
| Plant and equipment.....           | 914,488      |
| Real estate and lands.....         | 123,447      |
| Accounts and bills receivable..... | 24,126       |
| Ores on hand at cost.....          | 731,723      |
| Inventory supplies.....            | 114,347      |
| Miscellaneous.....                 | 4,909        |
| Total.....                         | \$14,587,549 |
| LIABILITIES.                       |              |
| Capital stock.....                 | \$13,363,030 |
| Accounts and bills payable.....    | 660,584      |
| Surplus.....                       | 563,934      |
| Total.....                         | \$14,587,549 |

**Iowa Lillooet Gold Mining Co.**—This company has placed an order with the Wm. Hamilton Mfg. Co., Peterborough, Ontario, for a modern gold dredging plant, to handle at least 2500 cubic yards per 24 hours. The dredge is to work on the Fraser River.

**United Gold Fields of British Columbia.**—This company operating the Lille Collieries, near Frank, Alberta, is rapidly completing its equipment. The J. H. Montgomery Company, of Denver, Colo., has secured the bulk of the order, including 50 coal cars, screens, track, cables and bull-wheels, for a 3,000 foot aerial tramway. The tramway is to be built up the mountain between Bear and Porcupine gulches, and the coal taken from both of these gulches will be sent down over this tram to the railroad. At the foot of the tram, and on the railroad, coal bunkers, a tripple, and other necessary structures will be erected. The tram, which is a gravity one will be operated and controlled from the top of the incline by a bull-wheel and break. It will be run by a cable, the loaded car descending furnishing sufficient power to pull the empty car up.

**Canadian Oil Exploration Company, Limited.**—Registered on January 26th, with a capital of £10,000 in £1 shares. Object, to adopt agreements (1) with the Canadian Oilfields, Limited, and (2) with the Maritime and Commercial Trust, Limited, and to carry on in Canada and elsewhere the business of explorers, owners of oil-bearing lands, pipe-lines, rights and property, winners and refiners of and dealers in petroleum and other mineral oils, manufacturers of petroleum and oil products, etc. Minimum cash subscription, 50 per cent. of the shares offered to the public. The management is vested in the Maritime and Commercial Trust, Limited.

**Monitor and Ajax Fraction, Limited.**—Report for month of February:—

|                                                    |            |
|----------------------------------------------------|------------|
| Feb. 28.—Ore shipped and settled for 107 tons —    |            |
| Crude galena, 89 tons, net proceeds.....           | \$3,802 40 |
| Screenings, 18 tons.....                           | 298 88     |
| Feb. 28.—In transit—                               |            |
| Crude galena, 15 tons, estimated net value..       | \$700 00   |
| Iron, 6 tons, estimated net value.....             | 65 00      |
| Feb. 28.—Ore in hand—                              |            |
| Crude galena, 25 tons, estimated net value..       | \$1,125 00 |
| Ore mined during the month—                        |            |
| Crude galena, 105 tons, estimated net value..      | \$4,500 00 |
| Cost of mining per ton, 8.65.                      |            |
| Cost of mining per ton, 9.35 previous month.       |            |
| Development, 77 feet.                              |            |
| Cost of development per foot, 7.08.                |            |
| Cost of development per foot, 6.05 previous month. |            |

**Mikado Gold Mining Co.**—The directors of the Mikado Gold Mining Company, Limited, have issued a circular stating that, as responses to the offer to shareholders of subscribing for debentures of the company in order to provide the necessary working capital have been very small, the Board did not feel justified in going to allotment, and the money subscribed was returned. The position at the present time, however, is such that a considerable sum of money must be provided in order to pay the debts of the company and provide sufficient funds to enable the property to be protected and preserved as a going concern. Accordingly, after deliberation, the Board has decided that it will be necessary, in order to provide the requisite capital, to sell the assets and undertaking of this company for a consideration, payable in partly-paid shares of a new company. It is intended that the new company to be formed shall have a nominal capital of not exceeding £75,000, divided into 75,000 of £1 each, and having for its object the acquisition of the assets and undertakings of this company, and the consideration payable to this company will be the payment and satisfaction by the new company, as this company or its nominees of such a number of shares of £1 each, credited with the sum of 15s. per share paid up, in the proposed new company, as this company shall call for, not exceeding in all 75,000 of such shares. If the whole of the 75,000 shares are allotted a sum of £18,750 will be available, but if this company calls for an allotment of a smaller number the cash available will be correspondingly reduced. With a view to carrying out the proposed arrangement the directors have entered into an agreement with Colonel William John Engledue (on behalf of the intended new company), and the directors consider it highly advisable that the shareholders should sanction the above-mentioned agreement, and for that purpose

pose a meeting has been called for the 14th inst., when a resolution will be submitted.

**West Canadian Collieries, Limited.**—Registered on April 2, with a capital of £400,000 in £1 shares. Object, to carry on in Canada or elsewhere the business of explorers, miners, owners, workers, and prospectors of mines and ground supposed to contain coal or other minerals, ores, or precious stones, etc. No initial public issue. The number of directors is to be not less than three nor more than seven; the signatories are to appoint the first. Qualification, 100 shares. Remuneration, £100 per annum and £50 extra for the chairman. Registered office: Palmerston House, Old Broad Street, E.C.

**Big Master Gold Mine.**—This Gold Mine in the Manitou District of Ontario, has resumed active mining. Mr. George Berry, amalgamator at the West End Silver Mines, has taken charge of the Big Master Mill.

**Velvet Rossland.**—The manager cables:—"Have received the following returns from smelters, namely—450 tons second-class ore yielded 364 ozs. gold, 35,400 lbs. copper; net returns from smelters, \$7,877, or an average of £3, 12s. 6d. per ton."

**Coke Shipments from the Crow's Nest Pass.**—When a settlement of the coal strike was reached at Fernie, there was quite a quantity of coke piled up ready for shipment at Fernie and Michel. A large amount of this has already been sent out to the smelters. The shipments commenced at Michel on April 2nd and at Fernie the following day. Up to yesterday 43 carloads or 983 tons have been sent out of Michel and 57 carloads or 1,311 tons from Fernie, making a grand total of 2,300 tons shipped to date since the commencement of the month. The renewal of the coke shipments has necessitated the employment of more train men by the C. P. R., and a fresh crew of six men has been put on at this point. This crew were laid off at Eholt some three weeks ago but a further force will now have to be employed in the Boundary country, and fresh men will be taken on there probably this week. The coal and coke is passing through Nelson at the present time at the rate of two barges or 700 tons per day. In place of bringing the barges into Nelson from the landing, the boats are unloaded at Proctor and the trains rushed through as expeditiously as possible. The coal company has made a slight increase in the price of coke, raising the figure to \$4.50 per ton or an advance of 25 cents on the price before the strike commenced. The smelter managers are probably not over pleased at the increase, but as they have recourse against the mine managers, the latter will eventually pay the difference.

**Trail Smelter After Slocan Zinc.**—American buyers of zinc have now a local competitor to meet in the general rustle for the product of the Slocan mines. The Trail smelter is making an active bid for the Slocan article. It promises to continue an active competitor in the field, so that zinc owners will always find a ready market for their product. Already a number of shipments have been received from the Bosun and Ivanhoe, and others are expected in the near future. The rates being paid by the Trail smelter are very favorable as compared to those offered by the zinc smelters in the United States. On Thursday foundations were started for the construction of a slime treatment plant at the Trail smelter. Silver slimes, somewhat similar to those produced in copper refining, are turned out in connection with the electrolytic refining of lead, and these were formerly shipped to the United States for treatment. They contain the precious metals, gold and silver, combined with arsenic, antimony and other impurities occurring in the lead bullion. When in operation, this plant will turn out pure silver, which goes direct to China and Japan; pure gold, which will be marketed in Seattle and San Francisco; copper sulphate which will be marketed in the territories for washing seeds, and either metallic antimony or antimonial lead, which will supply the Canadian demand in making babbitts and other alloys. The establishment of this plant places the Canadian miners and smelters entirely independent of the United States institutions. It is estimated that the amount of values handled in this plant will eventually be ten or fifteen thousand dollars daily, depending upon the amount of ores shipped. Two copper furnaces are now in operation at Trail, and it is barely possible that a third will be started in the course of two or three weeks. It is impossible to tell when the lead works will be put in operation again. At present there is practically no lead ore being produced, on account of the very unsatisfactory prices.

**Wire Rope Tramway Installations.**—In addition to the installation of an aerial tramway at the Lille Collieries, mentioned elsewhere, B. C. Riblet, of Nelson, B.C., has closed a contract with the Calumet and B.C. Gold Mines Ltd. for a line from the Eva Mine, in the Fish River Camp, to mill, a distance of 4,200 ft. He has also secured a contract for an important extension to the two miles of tramway at the Silver Cup Mine, near Ferguson.

POCSON, PELOUBET & CO.

PUBLIC ACCOUNTANTS

|           |       |                    |
|-----------|-------|--------------------|
| NEW YORK  | - - - | 20 Broad Street    |
| CHICAGO   | - - - | Marquette Building |
| ST. LOUIS | - - - | Chemical Building  |
| BUTTE     | - - - | Hennessy Building  |



FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

F. E. LEUSHNER,  
Room 12, Janes Bld., TORONTO, Canada.

**A. LESCHEN & SONS ROPE CO.**  
920 - 922 N. 1<sup>ST</sup> STR. ST. LOUIS, MO.

BRANCH OFFICES: { 92 Centre St., • NEW YORK, N. Y.  
137 East Lake St., • CHICAGO, ILL.  
85 Fremont St., • SAN FRANCISCO, CAL.

WIRE ROPE &  
AERIAL WIRE ROPE  
TRAMWAYS



Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

8 TRAINS DAILY 8  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Wagner Sleepers between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

E. J. CHAMBERLIN, General Manager. J. E. WALSH, Ass. Gen. Passenger Agt.  
C. J. SMITH, Gen. Traffic Manager.

EIGHTH MONTHLY DIVIDEND, Feb. 15th  
WILL BE PAID BY THE  
**60%** California-Nevada Mining Co.  
PER ANNUM GUARANTEED

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT READY FOR THE MILL and the Hoodlum Claim, which adjoins the Old Victor Mine, yet to figure on. A 200-TON PER DAY PLANT CONTRACTED FOR and will be in full operation not later than April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.

Do not fail to investigate this proposition, for the more you investigate the more stock you will want. Write for prospectus.

W. H. BALDWIN & CO., Brokers and Financial Agents 49-50-51-52 VOLCKERT BLDG., ALBANY, N. Y.  
REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company, Los Angeles, Cal.; any mining journal of the state or prominent mining men.



## Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

### SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

### PUBLICATIONS.

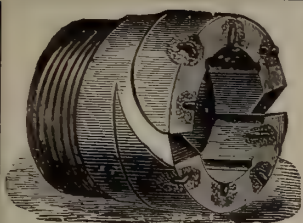
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

B. T. A. BELL, Secretary,  
Orme's Hall, Ottawa.





GOODS SENT SUBJECT TO APPROVAL

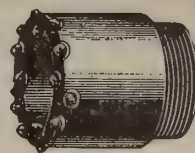
**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



**LAURIE ENGINE COMPANY**

MONTREAL - - CANADA

**IMPROVED**

**CORLISS**

**ENGINES**

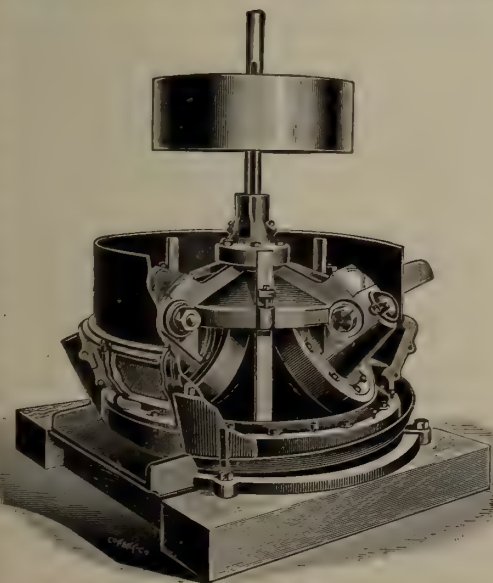
SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

FOR ELECTRIC LIGHT and POWER PLANTS.



**THE GRIFFIN**  
THREE ROLLER  
**..ORE MILL..**

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.



# BRIQUETTING MACHINERY FOR SMELTERS AND BLAST FURNACES....

BRIQUETTE your Flue Dust, Fine Ores, Calcines, Concentrates, Slimes and other Mineral Fines

INCREASES THE CAPACITY OF THE FURNACE FROM 10 TO 25 PER CENT.

Our Improved WHITE MINERAL PRESS the only successful machine for the purpose.

Adopted by most all the Prominent Smelters in the United States.

Used by several Large Steel Works for briquetting Common Iron Flue Dust.

Sent on Trial and  
Satisfaction Guaranteed.

**CHISHOLM, BOYD & WHITE CO.**

CATALOGUE MAILED ON  
REQUEST

OFFICE AND WORKS: 5700 Wallace St.

CHICAGO, ILL., U. S. A.

# WIRE ROPE

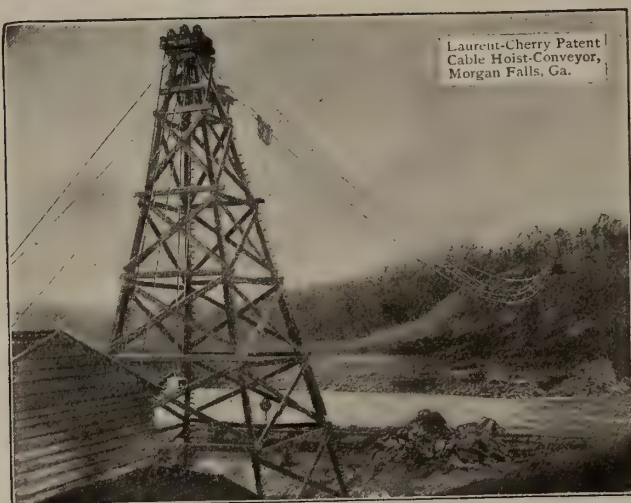
We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

**MONTREAL.**

Obtain our Prices.

# MINE RAILS



MANUFACTURED BY

## THE TRENTON IRON CO.

TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.

Also, Wire Rope Equipments for Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining  
Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated  
Canadian Mining Institute.

Vols. I, II, III and IV Canadian  
Mining Institute.

**\$20** WILL be paid for a complete  
set of these volumes. Readers  
having any, or all, of these copies for  
sale please write to

**The Canadian Mining Review**

OTTAWA, Canada.



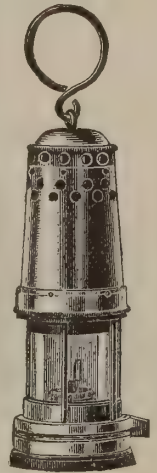
# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST MANUFACTURERS MINERS SAFETY LAMPS OF ALL KINDS

DAVIS'S PATENT ELECTRICALLY LIT LAMP TO BURN SPIRITS.



DAVIS'S "A.1" DEPUTY'S FIREBOSSSES AND SHOT-FIRER'S LAMP.



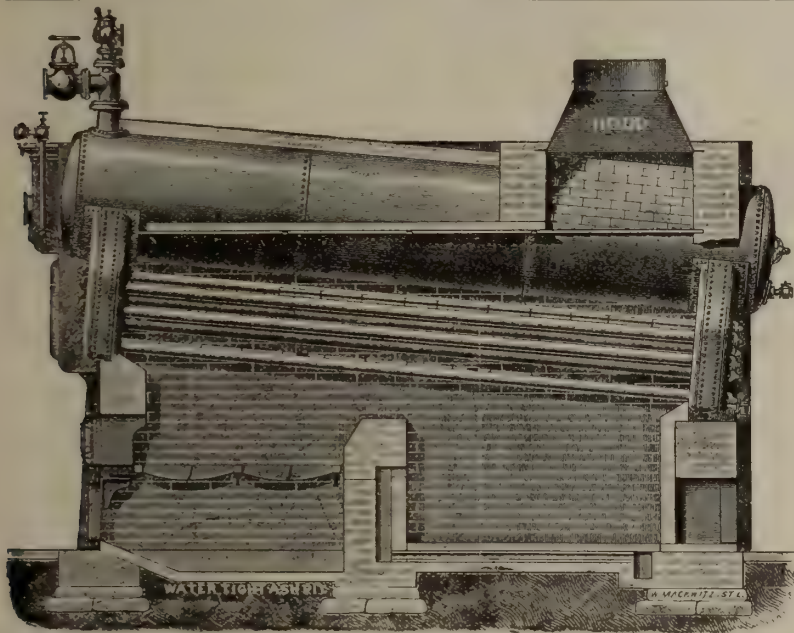
Stock at Montreal.

Sole Representative for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building MONTREAL.

Send for Catalogue and Prices.

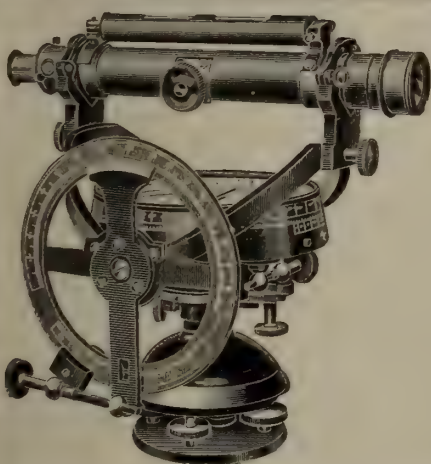


## HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co.  
TORONTO, ONT.

THE HEINE SAFETY BOILER—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890

## SPRINGHILL COAL.

The Cumberland Railway & Coal Company

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

Head Office : 107 ST. JAMES STREET, MONTREAL

Address : P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





## PROVINCE OF NOVA SCOTIA.

# Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

# PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

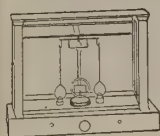
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.

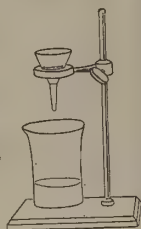


## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



**The Chemists & Surgeons Supply Co. Ltd.**

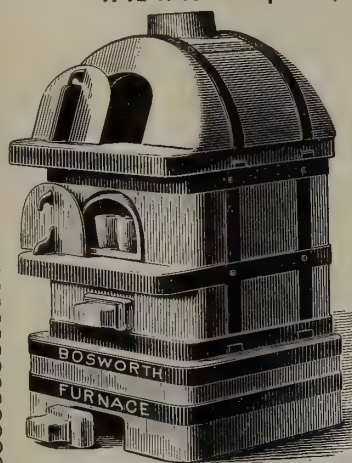
CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.



**ASSAYERS and CHEMISTS  
SUPPLIES.**

MANUFACTURERS OF

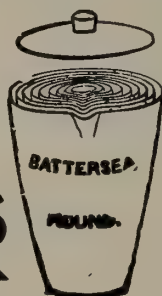
**Furnaces, Crucibles,  
Scorifiers, Muffles,**

and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

**COMPLETE ASSAY OUTFITS.**

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

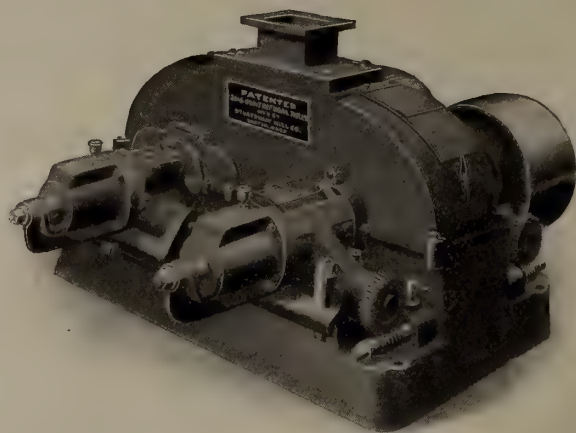
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

**Lyman, Sons & Company**

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.

## Centrifugal Crushing Rolls



**TIRES  
CUSHIONED BY SPRINGS**



PATENTED



Common Rolls are to spring-tired Centrifugals what the Dump Cart is to an up-to-date Rubber-tired carriage. Spring-pressed tires absorb crushing shocks. A cart, shaky enough at a walk, can scarcely hold together going faster on a road easy for a modern carriage.

If you are interested in a Roll constructed to LAST and turn out the largest product at the smallest expense, write for our catalogue of

**CRUSHING, GRINDING and  
SCREENING MACHINERY.**

**STURTEVANT MILL CO.**

BOSTON, MASS.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

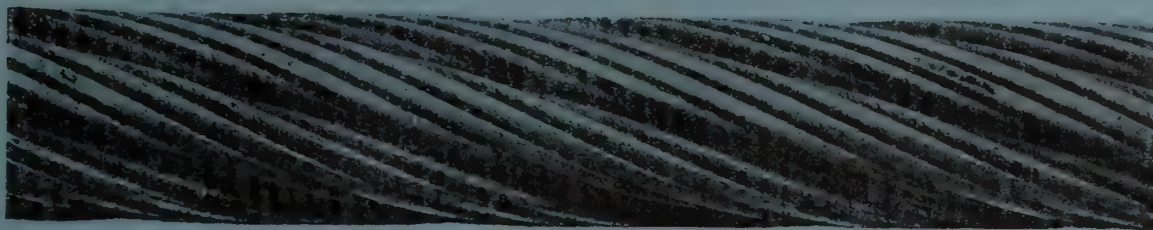
MANUFACTURERS OF

## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.  
Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

Illustration of Winding  
Rope, 240 fms. long x  
3 1/2 circ. Galvanized  
Special Improved  
Patent Steel, Com-  
pound Make, supplied



to Kenneil Collieries,  
Bo'ness, Scot., which  
gave a record life of 6  
years and 2 months.  
Shewing condition  
when taken off.

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA :

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

## Drummond, McCall & Co.

**IRON, STEEL and GENERAL METAL MERCHANTS**

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Stear Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: **CANADA LIFE BUILDING - MONTREAL.**

**Montreal Pipe Foundry Co.**

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES :

Canada Life Building - MONTREAL.

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

**CANADA LIFE BUILDING, MONTREAL.**

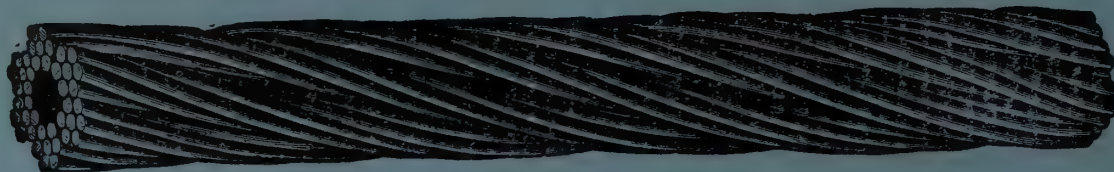
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS . . .

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard  
IMMEDIATE SHIPMENT.

### LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
..IN STOCK..

**COOPER**

ORE

AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, Etc., Etc.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. V.

OTTAWA, MAY 30th, 1903.

Vol. XXII—No. V.



**THE CANADIAN RAND DRILL CO**  
SHERBROOKE, QUE.  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.





ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

ROSSLAND, P.O. Building



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

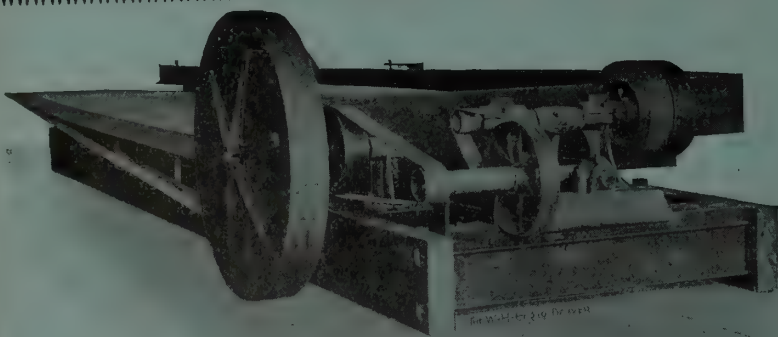
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

**ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.**

**THE CANDA PATENT SELF-LOCKING CAM**

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

**CHROME STEEL WORKS,**

**BROOKLYN, N.Y., U.S.A.**

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

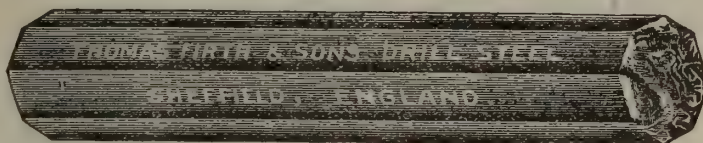
T. I. JONES, Treasurer.

**THOS. FIRTH & SONS, Ltd., Sheffield,**

**Tool Steel and Rock Drill Steel**

ALWAYS CARRIED IN STOCK.

SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL SHELLS, CRUSHER PLATES.

**H. W. DeCOURTENAY & CO.**

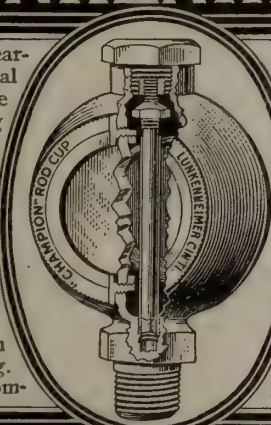
86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

**The LUNKENHEIMER**

Suitable for all movable bearings, is simple and practical in construction and can be filled without detaching plug. Glass sides show stage of oil. Attach cup so that the glass sides are parallel with the rod. When cup is in motion the oil begins to travel in a body within the cup, and at each revolution is thrown against the feed tube and flows down through it to the bearing. The centrifugal force, com-



bined with the shape of the body, carries the oil to the holes in the feed tube. A trial solicited and satisfaction guaranteed. Write for catalogue of superior brass and iron steam specialties. Specify "Lunkenheimer" make and order from your dealer.

**The Lunkenheim Co.**

Sole Makers and Patentees,  
CINCINNATI, OHIO, U. S. A.

BRANCHES:

NEW YORK: 26 Cortlandt Street.  
LONDON: 85 Great Dover Street.

**"CHAMPION" ROD OIL CUP**

**C. L. BERGER & SONS**

37 William Street

BOSTON, Mass.

SUCCESSORS TO

BUFF & BERGER.

SPECIALTIES:

Standard Instruments and Appliances for

Mining, Subway,

Sewer, Tunnel,

and all kinds of Underground Work

SEND FOR CATALOGUE



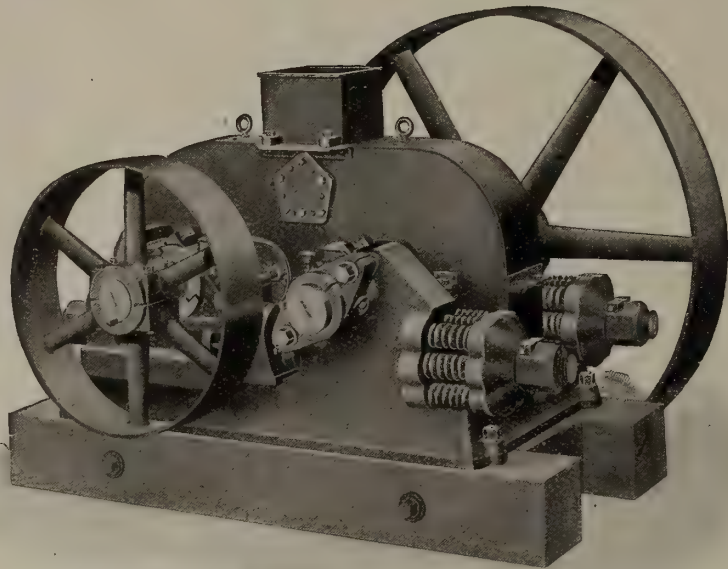
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'FG CO.,  
SCRANTON, PA.

BUILDERS OF

## MINING MACHINERY



STYLE B CRUSHING ROLL.

### Crushing Rolls

Our standard line of crushing rolls consists of three styles, as follows:

Style A. (Formerly known as Gates High Grade Roll).

Style B. (Formerly known as Fraser & Chalmers Standard Roll).

Style C. (Formerly known as Fraser & Chalmers Belt Roll).

We aim to carry in stock all standard sizes of the above named rolls, and also keep on hand a full line of repair parts for same. All special sizes of these rolls mentioned above and crushing rolls formerly built by the constituent companies will be built upon special order. We are also prepared to furnish repair parts on special order for crushing rolls formerly manufactured by the constituent companies.

Builders of

**Gates Rock and Ore Breakers. Chilian Mills**  
**Huntington Mill. Blake and Dodge Crushers**

**BRANCH OFFICES:**

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

**GENERAL****CHICAGO,****OFFICE****ILL., U.S.A.**

LONDON, ENG., 160 Dashwood House

JOHANNESBURG, South Africa

**BRANCH OFFICES:**

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennes Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'F'G CO.,  
SCRANTON, PA.

LARGEST BUILDERS IN THE WORLD OF

## ROASTING FURNACES



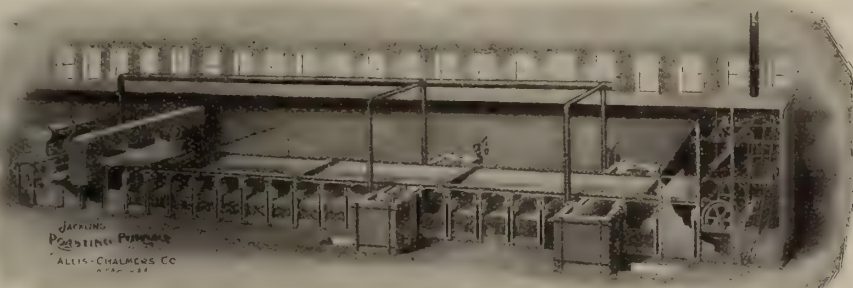
Allis-Chalmers Co. controls the sole and exclusive right of manufacture and sale of the Brown Roasting Furnaces, Jackling Roasting Furnaces, Wetthey Roasting Furnaces, McDougall Roasting Furnaces.

The Brown Straight Hearth Roasting Furnace is built of different lengths, having roasting hearths from 100 to 200 feet long and 10 feet wide.

The Brown Circular or Oval Roasting Furnace (horse-shoe type), is often built with a cooling hearth.

The Jackling Roasting Furnace has a roasting hearth from 100 to 200 feet long by 12 feet wide.

The Wetthey Roasting Furnace has a roasting hearth 121 by 12 feet, with cooling hearth underneath the roasting hearth.



The McDougall Roasting Furnace is a vertical brick cylinder encased in iron, and has six roasting hearths each 14½ feet in diameter, placed one above the other.

All Ores and Mattes in a pulverized condition which require roasting for subsequent metallurgical operations can be satisfactorily roasted in any of the above mentioned furnaces. Sizes, cost and other information cheerfully furnished.

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

### GENERAL

## CHICAGO,

LONDON, ENG., 160 Dashwood House



### OFFICE

## ILL., U.S.A.

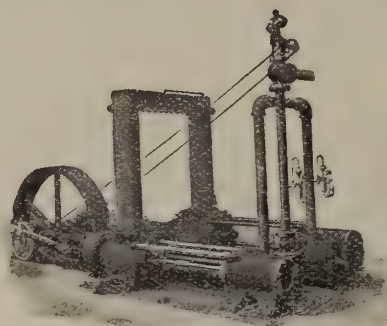
JOHANNESBURG, South Africa

### BRANCH OFFICES:

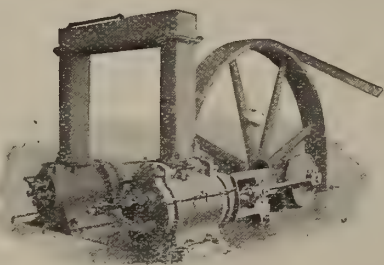
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO.



Class B-D Compressor  
[Air Cylinders next to Frame]



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Duplex (Mayer-Valve) Compressor



Straight Line Belt Driven Compressor



Cross-Compound Corliss Compressor

EASTERN BRANCHES  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

HEAD OFFICE & WORKS.  
**SHERBROOKE,**  
QUEBEC.

WESTERN BRANCHES  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE



**The Popular Fuse Throughout the Dominion**

SOLE MANUFACTURERS

**WM. BENNETT SONS & Co.**

ROSKEAR SAFETY FUSE WORKS

**Camborne, Cornwall, England.**

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :-

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

**THE HAMILTON BRASS  
MFG. CO., Limited.**

HAMILTON. ONT.

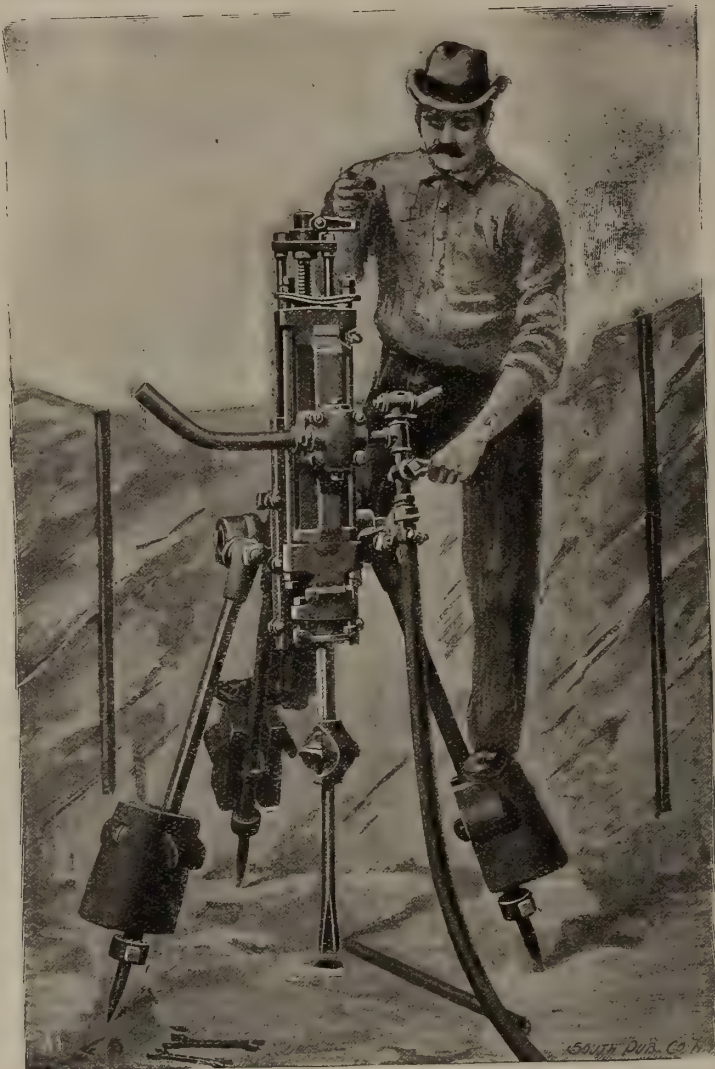


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

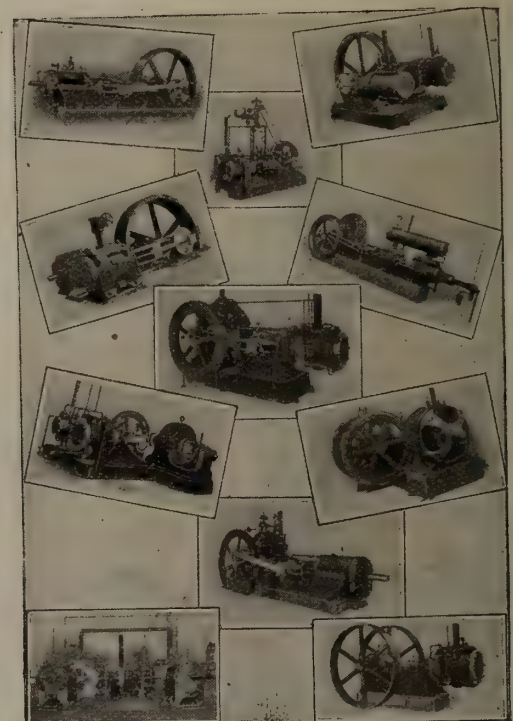
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



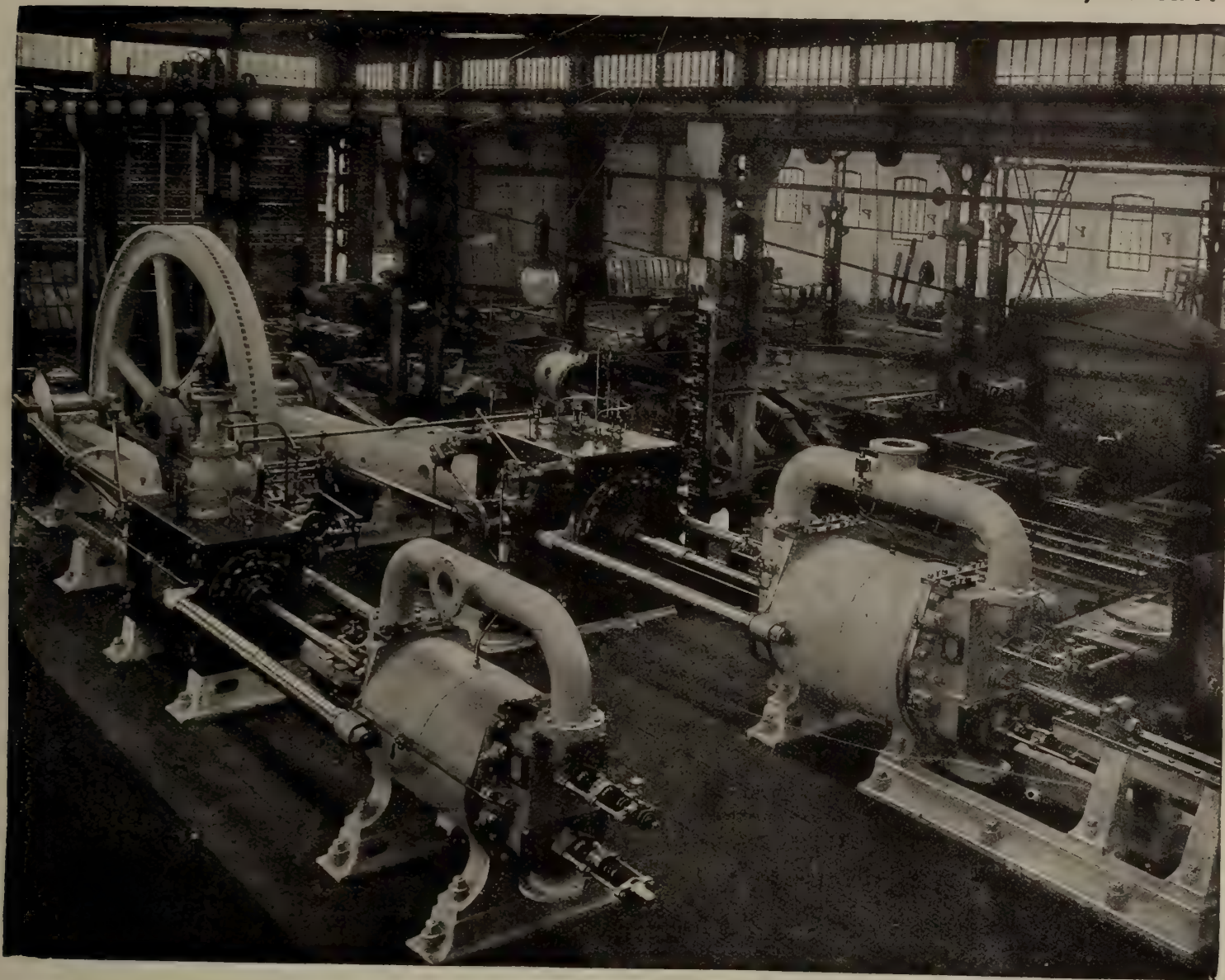


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery :-

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices

LONDONNEW YORKPARIS

J. BASZANGER &amp; CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

## CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF

## HAMMERED AND ROLLED STEEL FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASGOW, N.S.



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# SULLIVAN

## Sullivan Rock Drills

**Economical**

**Rapid**

**Durable**

Sullivan 2 and 2½-inch Air Drills are favorites for all light mining work.



Two 2½-inch Sullivan Drills working on 900-foot level of the Congress Mine, Congress, Arizona.

With one of these Drills, one man can do as much work as six men with hand hammers.

# MACHINERY CO.

NEW YORK  
PITTSBURG

135 Adams Street, CHICAGO  
U. S. A.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS:

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office: MONTREAL, Que.

**JAS. P. CLEGHORN,**  
 President.

**CHARLES FERGIE,**  
 Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

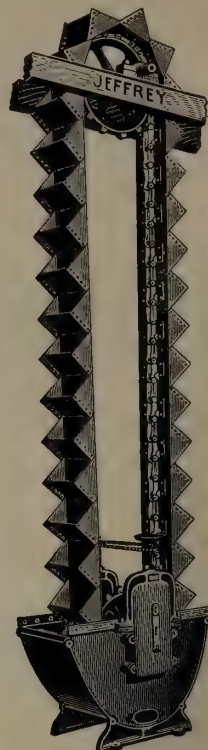
COAL CUTTERS

Power Drills

Crushers

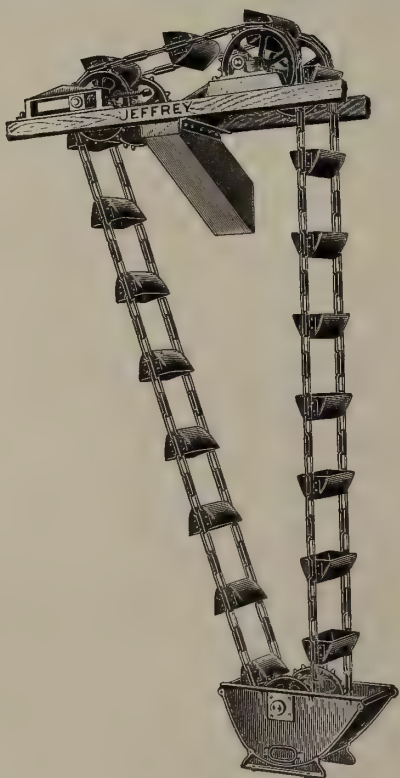
Screens

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.



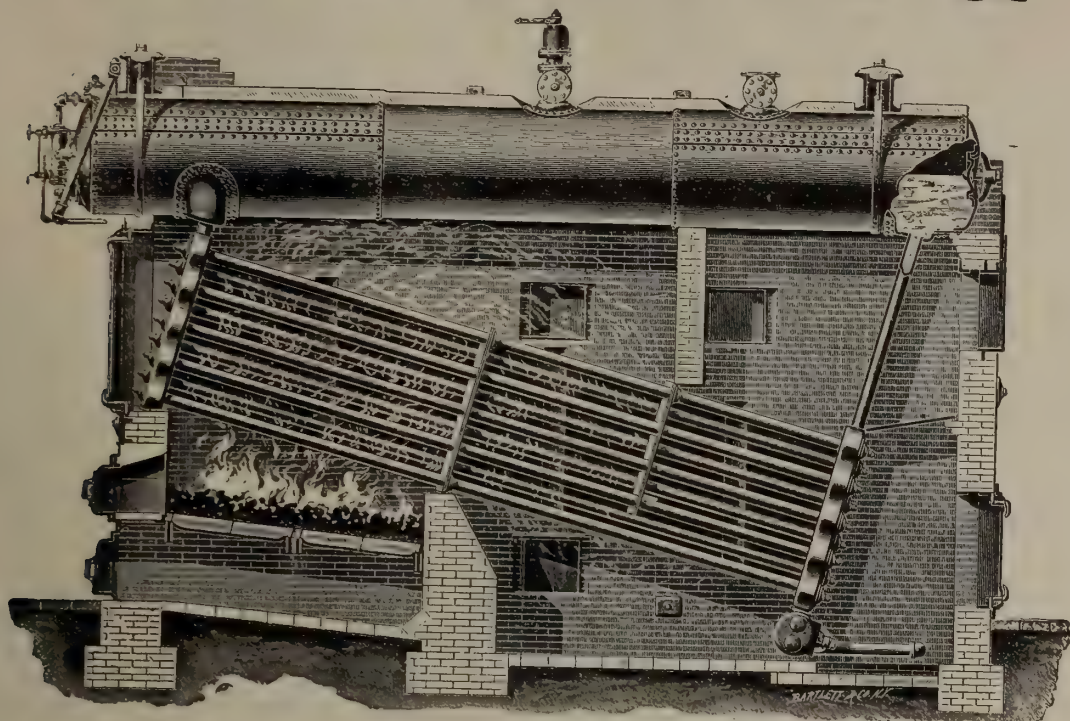
**WILLIAMS & WILSON**  
MONTREAL AGENTS

NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**  
HEAD OFFICE FOR CANADA:  
NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL  
**Caledonian Iron Works Co. Limited**  
**MONTREAL, Que.**

**BOILERS** TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY  
GEARS, PULLEYS, HANGERS  
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

**WORTHINGTON PUMPS**

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# Electric Blasting Apparatus.

Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

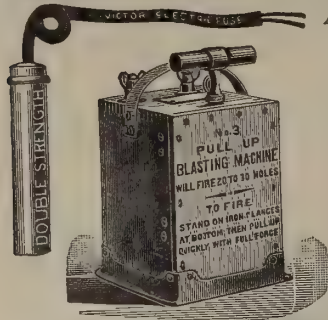
Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

MANUFACTURED  
ONLY BY

SEND FOR  
CATALOGUE



# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

# DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address,

MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P.Q.

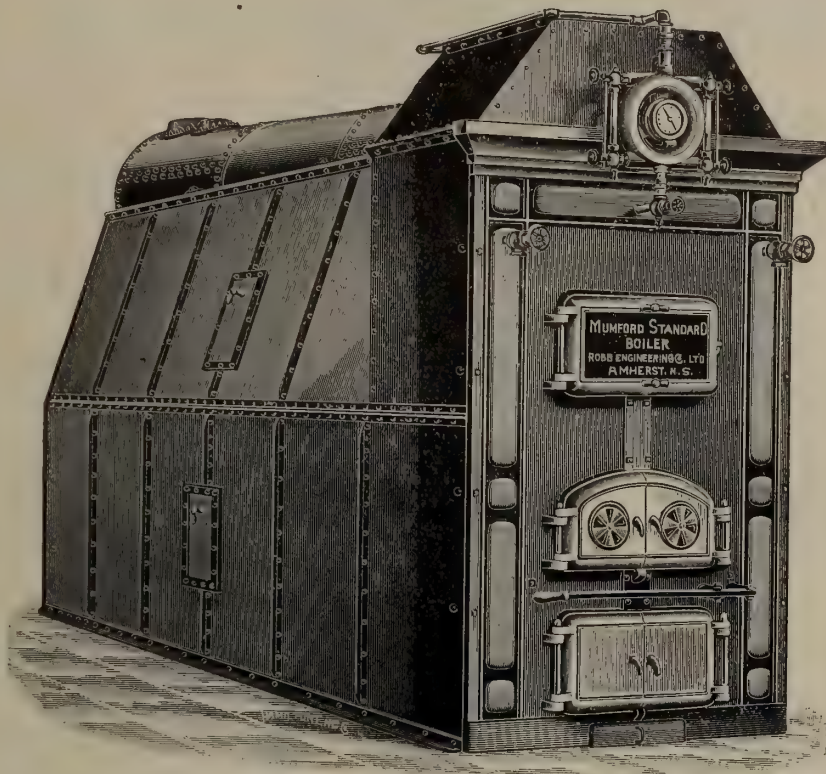
# MILL AND MINING MACHINERY

Shafting. Pul'ys, Gearing, Hangers, Boilers, Engines, Steam  
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron  
Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works. **OTTAWA**



## The Mumford Standard Boiler



### Proved a Success

This boiler has been built by us for several years, and is used from the Atlantic to the Pacific with most satisfactory results. It combines, to a remarkable extent, the best features of other types of boilers.

### Saves Fuel

The firebox is entirely surrounded by water so that no heat is lost by radiation or by air leakage which takes place in brick-set boilers. An internal furnace saves at least 10 per cent. over an external furnace.

### Perfect Circulation

The boiler consists of an upper and lower drum connected by two necks giving continuous and rapid water circulation. This causes the water to absorb more heat and makes the expansion uniform.

### Easily Cleaned

Two settling chambers are provided for catching deposits of scale making material, and all parts of the boiler are accessible for cleaning.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**AGENTS :** WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN
  - GROUP I.
    - (a) Mining Engineering.
    - (b) Chemistry and Mineralogy.
    - (c) Mineralogy and Geology.
    - (d) Chemical Engineering.
  - GROUP II.
    - (e) Civil Engineering.
    - (f) Mechanical Engineering.
    - (g) Electrical Engineering.
  - GROUP III.
    - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

**Next Session begins  
October 1st, 1902.**

**MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and further information, apply to

The Secretary, School of Mining, Kingston, Ont.



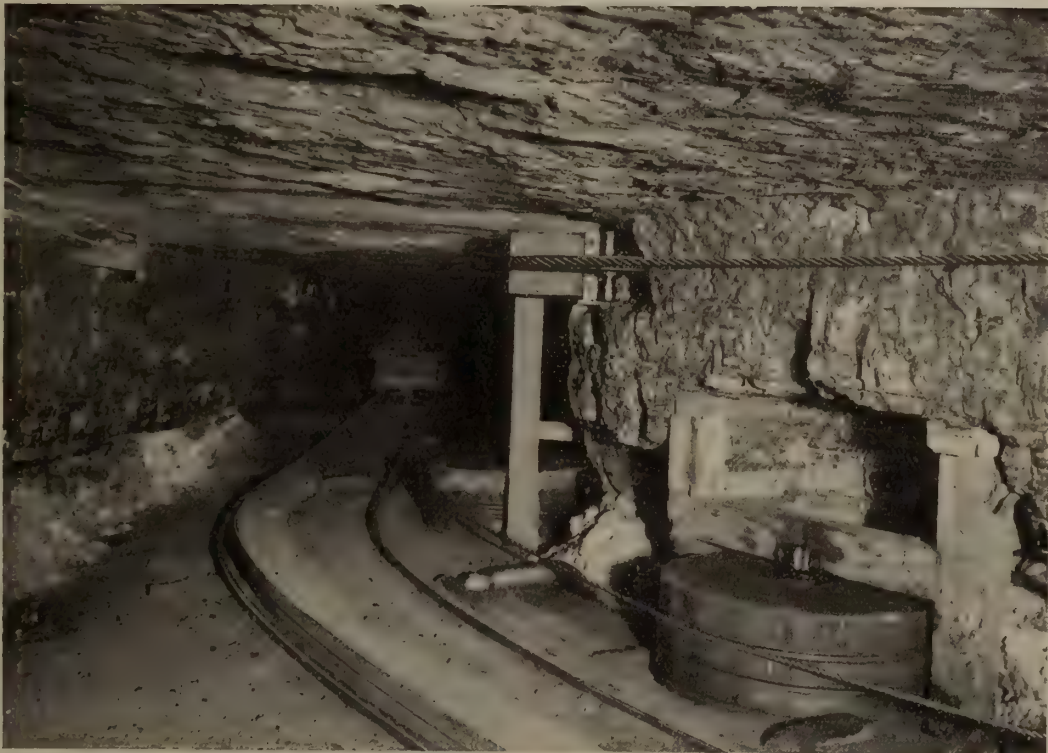
# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

Special Arrangement for Curves at the Sherrard Mine.

805-807-809 North Main St., St. Louis, Mo.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

**RICE LEWIS & SON**  
 LIMITED  
 HARDWARE TORONTO

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

### STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.

## A. LESCHEN & SONS ROPE CO.

SOLE MANUFACTURERS OF

Patent Flattened  
 Strand Wire Rope



Trade Mark Registered

REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

**LESCHEN'S** Aerial Wire Rope **TRAMWAYS**

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

BRANCHES: New York, Chicago  
 San Francisco.

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



LOBNITZ GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE.  
QUICK DELIVERY OF STANDARD SIZES.

ADDRESS LETTERS:  
**LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.**

Telegraphic Address:  
LOBNITZ RENFREW Al Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

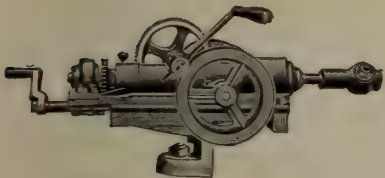
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

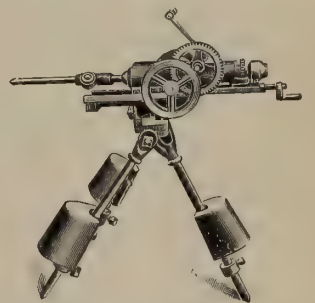
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.

# The Colorado Iron Works Co.

DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.**  
**DENVER, Colo.**



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address : - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING  
ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reserva-  
tions covering nearly a quarter of a million acres in  
Eastern Ontario, and principally within the belts con-  
taining Iron, Phosphate, Gold, Galena, Plumbago,  
Mica, Marble, Building Stone, and other valuable  
minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and Minerals

Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

**GEO. G. BLACKWELL, SONS & CO. LTD.**  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES :

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address : CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty :

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager. Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street MONTREAL

**ASSAYS OF ORES**ANALYSES of all materials made with greatest accuracy.  
SAMPLES BY MAIL—1 cent per 4 ozs.; limit 24 ozs.  
INSTRUCTION IN ASSAYING, Etc., to Prospect-  
ors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.8-KING STREET-8  
MANCHESTER, ENGLAND.**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

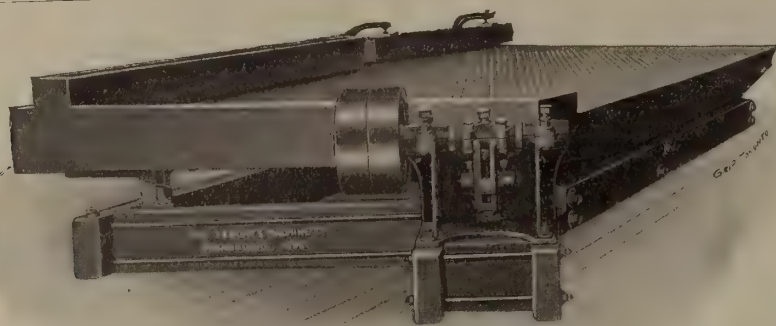
PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.





## The Overstrom Diagonal Concentrating Table

We have received repeat orders from numerous customers for this table, for the reason that for **Clean Concentration** and **Close Separation** it has no equal.

A postal brings you a catalog.

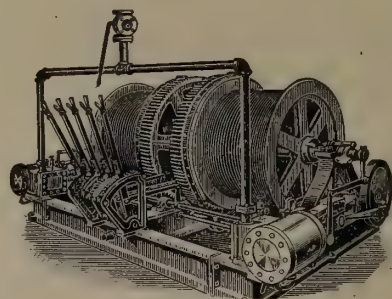
## THE JENCKES MACHINE COMPANY

Halifax Montreal  
Rossland

**SHERBROOKE**  
571 LANSDOWNE ST.

Toronto Winnipeg  
Greenwood

## M. BEATTY & SONS, Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**  
MONTREAL, QUE. ST. JOHN, N.B.



# WIRE ROPE

All kinds and sizes, and for all purposes.

Standard and Lang's Patent Lay.

PRICES RIGHT. PROMPT SHIPMENTS.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

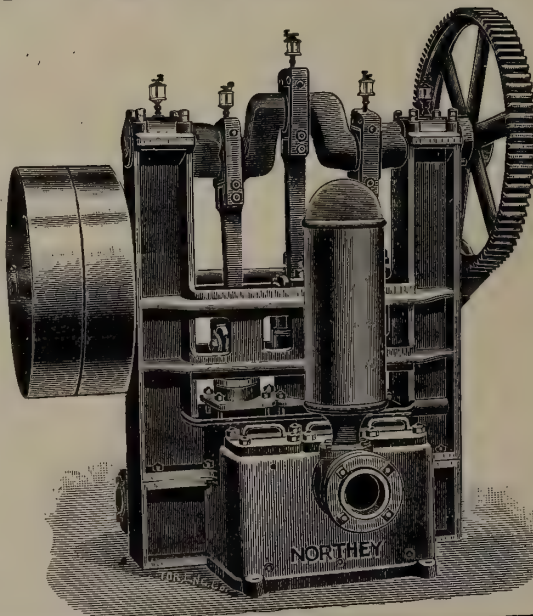
MONTREAL, QUE.

## Pumps for Mine Work Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 5.

MAY, 1903.

VOL. XXII., No. 5.

## The Future of the Dominion Coal and Steel.

Just a year ago we discussed at considerable length the prospects of Dominion Coal in particular and, more briefly, of Dominion Steel, and the result of our forecast with reference to the former has been almost exactly borne out by the year's trade. We estimated the profits on Coal for the year at \$2,500,000 and we argued that at all times Coal would be able to earn its eight per cent. guaranteed dividend and leave a respectable surplus of four to five per cent. at least for Steel. We argued further that the agreement under which eight per cent. was to be paid was distinctly more favourable to Steel than to Coal and that while the latter was a gilt-edged investment with assured success, the former could only be regarded as in the experimental stage with an uncertain future. The events of the last year and, especially of the last few months, have verified our deductions to the letter. Coal has done well, and but for a regrettable accident in the fire at Dominion No. 1 mine would stand in a better position to-day than ever. Meanwhile, however, it is impossible to speak as hopefully of Steel and, while we are neither pessimistic nor alarmist, we may be permitted to point out that the conditions surrounding this industry are such that unless a fundamental change can be made it is hard to say what may happen. That both concerns have sustained a serious loss by the resignation of Mr. Cornelius Shields cannot for a moment be denied, indeed, coming at what may almost be considered a crisis in their history it is a loss which is almost irreparable and may be fraught with serious results. It is an open secret that Mr. Shields is the only manager who has been in charge of either of these concerns with sufficient individuality and free scope to *manage*. His predecessors have more or less been handicapped by conflicting influences and divided counsels. Mr. Shields went there master of the situation and no one can conceive of him holding the position under any other conditions. It is a position which calls for just as strong a man to succeed him and if the firm grip which he has exercised over the Company's affairs is relaxed by a successor less experienced or less determined, then, whatever may become of Coal, it is certain that the Steel end of the industry will never know success. In connection with the latter the same mistakes which characterized the early days of Dominion Coal have been repeated. Rosy optimism, reckless and extravagant expenditure and miscalculation as to results have characterized the inception of the Steel Works. We are told on the best authority that these works if recommenced to-day could be erected and developed to their present stage of efficiency for two-thirds of what they have cost, which means an unnecessary expendi-

ture of several millions and is a heavy financial burden for the concern to carry. That this should be so is not to be wondered at when we consider how nearly all the estimates of the prospectus, and the early reports of the management have failed to materialize. For instance, our readers will well remember the important speech of Mr. A. J. Moxham before the Board of Trade, at Toronto, some two years ago, when he stated that pig iron would be produced at Sydney for \$5.00 to \$5.50 per ton; as a matter of fact the cost of pig iron at Sydney to-day is from \$10.00 to \$11.00, and it is doubtful if it will ever be produced below this figure. In view of this fact there is little wonder that the Directors find themselves driven to abandon the idea of manufacturing steel rails, as it would be quite impossible, even if other conditions were favourable, to compete with American or German manufactures, and to make the rails from an \$11.00 pig. But other difficulties have developed, notably a marked decrease in the value of the Belle Isle ore, which at one time averaged 55 per cent. of metallic iron but has fallen to 43 per cent. and sometimes even less. This involves not merely the necessity for importing large quantities of higher grade ore at a cost from \$5.00 to \$7.00 per ton delivered at Sydney but by so largely increasing the percentage of silica it diminishes the productive capacity of the furnaces. The expressed intention of the Company to turn their attention to the manufacture of structural steel, instead of rails, is a clear indication of their opinion on this subject and, whilst undoubtedly this branch offers better chances, it is certain that in normal conditions of trade structural steel from the States will be so cheap as to exclude the possibility of manufacturing at Sydney without heavy protection. This, of course, may be secured, but the present attitude of the Government may be taken as clearly indicating their disinclination to extend protection to their iron products. The recent provision for the duty of \$7.00 on imported rails and the safeguards with which the Government have seen fit to surround the provision affords little encouragement for the belief that they will extend protection. We have discussed this matter with some of the best iron and steel experts in the country, and the general opinion is that the whole subject of the steel manufacture at Sydney has undergone a change, since practical working has demonstrated that the basis of the industry, viz. pig iron is to cost double the original estimate. With a \$5.00 pig iron the contention of Mr. Whitney and Mr. Moxham as to the possibilities were probably justified. We were never among those who believed that a \$5.00 pig iron could be produced at Sydney; we must confess, however, that we were not so pessimistic as to anticipate the cost to be \$11.00. Since the budget speech of Mr. Fielding there has been a generally expressed opinion



that the Dominion Steel Company would benefit by the duty on rails and would at once make provision for this branch of manufacture. This, no doubt, is an important matter for consideration, and will probably receive attention during the next few weeks, but when we remember that before the present boom steel rails sold as low as \$15.00 at works in the States, and were delivered at \$17.00 on the Great Lakes, being made from a pig which cost in the neighbourhood of \$7.00 to \$7.50, it does not look as if the conditions would warrant hasty conclusions, but even if this difficulty could be overcome it is hard to see how the far greater and fundamental one of an unsuitable ore is to be met; with high silica and the maximum of phosphorus in the Belle Isle ore we do not believe that a rail can be made which would come up to Mr. Fielding's stated requirements as to quality. On the other hand, if a sufficient quantity of high grade ore, low in phosphorous and sulphur is imported to enable the Belle Isle ore to be used, then the cost will be proportionately raised. Altogether Mr. James Ross and his colleagues have before them a problem of the utmost difficulty which, for its solution, demands the able and most experienced experts that can be found. One can hardly bear to contemplate the possible consequences to the Maritime Provinces of any serious check in the development of this industry, and for that reason every effort should be made to ensure its success. If the Steel Works are to be a failure the effect on Coal would also be serious, as it would not be easy, even if possible, to establish a market to replace the local consumption guaranteed by this important enterprise.

The output of coal during the present year would be entirely satisfactory but for the unfortunate accident at Dominion No. 1. That the largest and most economic mine, with a capacity of 3,000 tons of coal a day should not merely be closed, but flooded, creates a situation of the utmost seriousness. It may be true that the increased development at the other mines will ensure a total production during the coming year equal to that of last year, but the production would have been a million tons more which would have meant at least \$750,000 additional profit. There are conflicting reports as to the length of time during which Dominion No. 1 will be out of commission. We deprecate some of the official statements which have been made; they minimize both the difficulty and the loss beyond what is defensible. We have the best authority for stating that whilst small sections of the mine can be worked within a short time, practically the whole of the mine will be non productive during the present year. One has only to accept the figures which have been put forward by the management, as for instance that 500,000,000 gallons of water will require to be pumped out of the mine, to see that given the most favourable conditions it will take a whole year to restore it to its original condition. The cost of doing this must run into six figures, and if we add the deprivation of tonnage, it will be seen that the loss during 1903 will fall not very far short of \$1,000,000.

In spite of this the coal dividend is not in any danger, which only serves to show how good a bargain the Steel Company made, but the latter will suffer severely, as at the present crisis they can ill afford to spare so large a sum from their revenue. Altogether we hold that Mr. James Ross, of whose financial ability no one holds a higher opinion than ourselves, will have to live right up to his reputation if he succeeds in steering this twin concern to a position of security and success. There is only one way in which he can do this, even if it be possible to do it at all, and that is to place the absolute control of both concerns, either unitedly or separately, in the hands of strong competent and experienced experts. He has already a large number of excellent subordinate officials especially in the coal department; these only require a suitable head and the result will be entirely satisfactory. As far as steel is concerned he has some good men but he still needs

the master grip. Meanwhile it is to be regretted that the situation is complicated by rumours which would appear to have at least some foundation, to the effect that several of the most prominent Steel men have parted with the whole or practically the whole of their stock, and that there is a constant shifting of control on that account. This is a condition which cannot make for stability, or success, and unless the impression is removed that this stock is held chiefly for speculative purposes the difficulty of making Steel a permanent industry is vastly increased.

### Imports of Mining Machinery.

The imports of free and dutiable mining and smelting machinery for the first quarter of the present year compared with 1902, are as follows:—

| MONTHS         | 1903      |          |          | 1902    |          |         |
|----------------|-----------|----------|----------|---------|----------|---------|
|                | Free      | Dutiable | Total    | Free    | Dutiable | Total   |
| January .....  | \$ 77,298 | \$ 7,676 | \$84,974 | 92,984  | 2,549    | 95,533  |
| February ..... | 30,106    | 1,587    | 31,693   | 43,123  | 2,380    | 45,503  |
| March .....    | 83,535    | 11,534   | 95,069   | 55,255  | 2,629    | 57,884  |
| Total .....    | 190,939   | 20,797   | 211,736  | 191,362 | 7,558    | 198,920 |

The principal sources from which this machinery has been imported were:—

| MONTHS         | UNITED STATES |          | GREAT BRITAIN |          | Other Countries | TOTAL    |
|----------------|---------------|----------|---------------|----------|-----------------|----------|
|                | Free          | Dutiable | Free          | Dutiable |                 |          |
| January .....  | \$75,235      | \$ 7,676 | \$ 417        | —        | \$1,646         | \$84,974 |
| February ..... | 29,467        | 1,587    | 639           | —        | Nil             | 31,693   |
| March .....    | 82,680        | 11,534   | 158           | —        | 697             | 95,069   |
| Total .....    | 187,382       | 20,797   | 1,214         | —        | 2,343           | 211,736  |

### Mining Legislation in Nova Scotia.

During the session of 1903 the mining legislation of this Province was distinguished by what may be termed paternalism.

For years past the extension of the coal seams of Cape Breton under the waters of the ocean has been well known to the geologist and mining engineer. The stimulus of the "Whitney Syndicate" introduced this fact to the speculative element, and the waters of the ocean adjacent to coal-bearing land areas are covered by innumerable licenses. To give these properties a standing access was necessary. The Mines Act did not provide this and a pretty battle was waged before the Legislature until finally an Act was elaborated giving a fair measure of justice to the owner of coal on the shore as well as to the owner of submarine coal. It may well be understood that driving tunnels through another's coal area means not only the loss of a certain amount of coal but possibly, in addition, the creation of a state of affairs precluding the proper and economical working of the rest of the coal. Provision is therefore made for securing to the party invaded a proper award for indirect as well as direct damages. The importance of the measure may be gathered from the fact that mining experts say coal can be readily mined to a distance of six miles from the shore, and that, within this distance from the shore there are millions upon millions of tons of coal.



For a number of years past all enginemen in charge of engines used for raising or lowering men into and out of coal mines were required to pass an examination as to their knowledge of engines, boilers, etc. This requirement has now been greatly extended and the engineer running any stationary engine about a colliery, the inefficient or unskilful handling of which might tend to injury to life or limb, is required to be the holder of a certificate.

Provision is made for three grades of certificates, and for the issue of Certificates of Service to those now handling such engines.

It was not brought out that there had been such inefficiency shown by enginemen as to call for special legislation outside of those handling engines raising or lowering men. However, experience has shown that there is frequently a deficiency in the supply of certificated enginemen for the above purpose, and when all the enginemen in a colliery hold certificates, vacancies can be readily filled. As the measure is calculated to advance the status of enginemen the Government is entitled to commendation for passing it, especially as some system of education must be provided at a considerable expense.

In this connection it may be remarked that, while the Government of Nova Scotia provides educational facilities for overmen and underground managers in the collieries, it has hitherto not given facilities for the education of those desiring managers' certificates, although they are called upon to pass difficult examinations. In view of the expense of providing such advanced education, it might have been a good step for the Government to have provided a certain number of scholarships for those passing the best examinations for underground managers. These men could then attend a mining school for a couple of years, and finally pass their examination before the Provincial Board.

The gold mining industry also received attention. The gold mines of Nova Scotia have seldom exceeded four hundred feet in depth. The maximum depths were reached in the few cases in which pay streaks ran at heavy angles, and continuously. It is claimed that the domed, or anticlinal structure of the gold fields giving rich ground at distances from the anticlinal axis equivalent to an original depth of several thousand feet warrants the expectation that in the vicinity of the axis deep workings would reach equally rich ground. As yet, however, no company has been found wealthy enough to put this view to the practical test of a 2,000 feet shaft.

The theoretical view, it is fair to say, has been borne out by the fact that the enrichment of the quartz has continued to vertical depths of over 700 feet from the surface. In order to assist enterprising miners in the solution of this problem, which is of great importance to the future of this industry, the Governor-in-Council has been authorized to appropriate a sum of money large enough to assist in the sinking of three deep shafts. The position of the shaft so assisted is to be one approved of by the Governor-in-Council, and the sinking to be under its regulations. Such assistance will be given only in the sinking of a shaft below 500 feet from the surface and to a vertical depth not exceeding 2,000 feet, and is in no case to exceed half the cost of sinking.

This offer may be fairly considered a generous one, and no doubt any companies now in a position to ask for the subsidy will come forward.

If, however, none are prepared at present to ask this help, the knowledge that it is available will induce others to qualify for it. It may be said here that while the deductions of the mining geologist have for years presented the possibilities of deep mining, the labors of Mr. Faribault, of the Canadian Geological Survey, his careful examination of the different Nova Scotia gold districts, and his elaborate maps have made the matter plain to the miner and the general public.

## CORRESPONDENCE.

### Gold Dredging in the United States.

*The Editor:*

I have read with interest, and some amusement, the article on gold dredging in the U.S. by Mr. Ralph M. Montague. From the tone of some parts of it I fear Mr. Montague is what we call in this country "disgruntled" because, so far, he has not been taken at his own valuation. The part referring to the "young graduate from college" will doubtless be replied to by the gentleman attacked, who is well known here and who has done successful work. The parts of the article I particularly wish to notice are those referring to what the writer calls "the New Zealand type of dredge," as some six years ago I introduced this type from New Zealand into the United States and made a success of it. That this type of dredge is a success is evidenced by the fact that during the last six years the Risdon Iron Works of this city has built from my plans over forty dredges, and are still engaged in the manufacture. Under the circumstances I certainly think I am entitled to expose the errors and fallacious statements made in the article above referred to in regard to the so called "New Zealand dredge," but which is now known in this country as the "Risdon" dredge.

In spite of Mr. Montague's unsupported assertion to the contrary the advocates of the "Risdon" dredge do not admit that the dredge held by a spud is necessarily a better digger than the dredge held by lines. Indeed the advocates of the "American" type are not quite satisfied on this point, if we may judge from the fact that the last American type of dredge built has been fitted with head line drum and side line barrels similar to a "Risdon" so that it can operate either way. Many competent engineers believe that, for the general run of gold dredges, the resiliency given by the head line is of great benefit by reducing the heavy jars to which the dredge is subjected when held solidly in place by a spud to which there is no give. The "Risdon" type of dredge can certainly be more rapidly handled when changing position as no delay is occasioned by resetting the spud, the digging going on continually. Another advantage of the rope operated dredge over the "spud" lies in the fact that the stern can be moved independently of the bow, which advantage will certainly appeal to any one who has had before him the practical question of stacking tailings.

As to the comparison between the height to which the two types lift the gravel: Although Mr. Montague states that his ratio is for lifts alone, the actual power required in lifting the gravel is so little as to cut no figure in the total power consumed. Any reader would naturally understand him to refer to the actual power consumed by the bucket belt, and in this connection, his deduction, even granting his data is correct, is entirely misleading; he is either very disingenuous or else he is ignorant of the fact that the bulk of the power expended is not in lifting the material but in the friction of the bucket belt over the two tumblers, and in actually digging out the gravel. The power expended in the friction of the bucket belt is largely independent of the height the material is lifted, and the power expended in actual digging is entirely so. Without entering further into detail the intelligent reader can readily see that the figures given as representing the ratio of horse-power, viz:—23; 42.2 are wrong.

In comparing the H.P. expended and cost per yard of material lifted, Mr. Montague has selected the lowest cost ever recorded for the "American" type, and the highest for the "Risdon," which of course is grossly unfair and very misleading. A three cubic foot "Risdon" dredge takes about 50 H.P. and readily handles 1000



cubic yards per day. One dredge of the "Risdon" type, by actual measurement, averaged over 1000 cubic yards per day for a whole year including days when laid up for repairs; this gives 20 cubic yards per H.P. average, instead of only 12 and makes the cost 1.34 pence instead of 2.03 as stated by Mr. Montague. Seeing that Mr. Montague is so inaccurate in some of his figures his statement that the cost of operating the "American" type is only 1.04 pence must be accepted with caution.

In saving fine gold it is generally admitted that the sluice box type of gold saver, exemplified by Mr. Montague's "American" dredge is vastly inferior to the "Risdon" type. It may be interesting to your readers to know that the first "American" type of dredge erected in Oroville proved a failure, and that it has now been altered to more nearly resemble the "Risdon" type. The dredges now built by the original manufacturers of the "American" type have few of their original characteristics, and are every year becoming more like the "Risdon" dredge.

In mentioning the three "American" type dredges in the Boise Basin, Mr. Montague omitted to state that the Basic has been altered by the Risdon Iron Works, and since then has been a success.

Mr. Montague is undoubtedly correct in stating that the close connected bucket dredges as now built, all dig more than they can properly wash and handle. The dredging industry is rapidly coming to the fore as a safe and profitable investment, and knowing that an influential paper such as yours wishes to put only reliable information before its readers is my reason for writing the above.

I am, yours truly,

R. H. POSTLETHWAITE.

SAN FRANCISCO, 15th May, 1903.

#### The Frank Disaster.

Within 14 miles of the summit of the Crows Nest Pass, Canadian Pacific Railway, nestles the little town of Frank. The cause which gave rise to its existence may have been a tributary cause of the desolation that presents itself to the eye of the observer now. Coal has been known to exist in this district for many years past, but not till the magnificent prospects of the Crows Nest Pass Coal Co., Fernie, B.C., attracted public attention did the prospector's eye turn to the eastern side of the coal basin. It is now a little over two years since the vertical coal seam at Frank was located, and from that time till now, work has been vigorously carried on by a progressive company until the output had reached 1000 tons in one day. The coal seam, 12 feet thick, is nearly vertical, with a sandstone wall on one side and hard shales on the other. The seam follows the trend of the mountain in a south-easterly direction, the main gangway having been driven 5,600 feet with workings all the way into the face. The system of working is a combination of pillar and stall and long-wall work, the surplus coal only being taken from the chutes. The coal had all been loosened to the surface for about 3000 feet from the entrance and was ready to be drawn when the disaster happened.

The mountain which overlies the cretaceous coal measures is a carboniferous limestone and towered to a height of 3,000 feet above the level of the valley. This mountain, or mountains, forms the first main range of the Rockies, and is termed the Livingstone Range, the particular peak above the town of Frank being called Turtle Mountain. About 4 a.m. on the 29th April night work was being carried on as usual and the siding had just been emptied of its load of coal by a C. P. R. train crew. The train had pulled out to the yard sidings at 4.10 a.m. when a fearful rumbling of the mountain was heard, and in the grey dawn of morning the only living souls who saw Turtle Mountain descend into the valley were the train crew of the C. P. R.

The mountain fell, struck the river bed, and with the inertia gained by the millions of tons falling 3,000 feet it swept over the valley like a mighty wave carrying everything before it. As it travelled, it spread, and from a width of 4,000 feet falling out of the mountain, it formed a fan-shaped mass at the outside ( $1\frac{1}{2}$  miles away) measuring over 8,000 feet. The area covered by this immense mass of limestone rock and a small portion of the cretaceous rocks where it broke, is over 900 acres. This area is covered to a depth of from 10 to 100 feet in height, across the whole valley, and reaches up to 400 feet on the mountain on the opposite side of the valley,  $1\frac{1}{2}$  miles away. The main line of the C. P. R. for  $1\frac{1}{4}$  miles is wiped out of existence and covered over to a great depth. The Frank & Grassy Mountain Railroad is also wiped out for over a mile and filled up with debris.

At the time of the disaster there were working in the mine 19 men, and out of that number 17 were saved. The two lost being a driver and a trapper boy who, no doubt, were at the time out on the tippie, as there was a trip of empty cars standing near the mine mouth ready to go into the mine. The 17 men who were saved dug themselves out about 80 feet from the main entrance to the main tunnel. The information gained from them is that the mine is very little damaged, a few timbers only in the gangway having been broken. The first intimation they had of anything being wrong was a serging of the hanging wall, then a crushing and falling of coal all around them. They made their way towards the mouth of the main entrance but found it blocked, going back into the mine about 4,000 feet they attempted to ascend the air shaft but this exit was also blocked. Again making their way to the lower tunnel, or first opening of the mine, they found their exit blocked by the inrush of water from the river which had dammed back to a height of 40 feet above its original bed. Their only course now was to try and dig themselves out at the nearest point to the main entry where there was the least covering. This they accomplished in 14 hours after passing through 20 feet of coal and earth, then nine feet of limestone boulders. During all this day of the 29th men were braving the dangers of falling rock from the mountain trying to open out the main tunnel, but before this was completed the miners had saved themselves. The great loss of life was entirely confined to the outside. The rocks and mud completely wiping out all tippie work, machinery, &c., demolishing six cottages and a number of smaller shacks and tents, two rancher's houses and a railroad camp which was situated a mile and a quarter away from the base of the mountain. The total number of casualties as far as can be ascertained is 66, although there may be a few more Slavonians or Russian Poles who are not accounted for.

Some remarkable escapes were made by those living in the cottages that were demolished, one whole family coming out without a scratch, between mud and boulders, with scarcely a vestige of their home being left; another case where six of the family were killed and only three left to tell the tale without any harm coming to them. Incidents of bravery were numerous, especially notable being the seven miners who were trying to open out the main tunnel and save their fellow-workmen. Rocks from the mountain were falling all around them, and the general manager remarking that it was rather dangerous work, the only reply was "Damn it, there are fewer men here than what is inside," and on goes the brave work. One man whose brother was entombed in the mine made the attempt to cross the foot of the slide to reach the air shaft on the other side, but his daring act was in vain as the shaft was completely covered by debris. Another incident well worth remembering was the act of the operator and brakeman who crossed the slide not knowing what next might come, to flag the passenger train which was just about due. After all the excitement of the 24 hours following the disaster, the rocks were still falling from the



mountain and this caused an uneasiness among the citizens left. A meeting was called and three (3) men were appointed to ascend the mountain, examine into the cause, and report the conditions if still dangerous. This arduous ascent was made on 2nd May, and the report made to the representatives of the Dominion and Territorial Governments, President of the Board of Trade, C. P. R. officials and Canadian and American Coal Co. officials. The report was such that Premier Haultain immediately issued a preemptory order for the town to be vacated. This was accordingly done, and on the evening of 2nd May there was not an inhabitant left in the town. The mountain has been examined every day since and the conclusions that will be arrived at on the 11th May will determine if it is safe to again occupy the town. The indications are that the town will once more be populated as the broken portion of the mountains yet to come down will do so by degrees and not endanger life or property.

The C. P. R. have decided to go ahead with the reconstruction of the two miles of road wiped out, and in the course of a month all should be running smoothly again. The coal company have decided to open up their property again by sinking a slope on the coal immediately behind the town. The only loss to them, although heavy, is confined to machinery, plant, and stoppage of shipping; the actual loss in coal is small and the property will, in the course of eight or ten months, be as large a producer as before the disaster. With all the sadness caused by the loss of life in such a disaster there is always a humorous side to it and this happens in the conclusions that have been drawn as to the cause of the slide.

The first impressions were that a volcano had started in the mountain, some going as far as to say that they saw the flames and smoke, even pointing out the lava flowing down the side of the mountain.

The next thing was that of an explosion in the mine but this was soon exploded by the colliers showing up through the limestone boulders.

Others again said it was an earthquake and it started right in the centre of the valley where they saw rocks tumbling around like nine-pins.

Another propounded the theory of the tail of a meteorite striking the mountain "biff" and down she goes.

The most improbable theory was the three elements, coal, lime and water, forming a great body of acetylene gas, and off it goes by some unknown cause, removing mountains. Others again mixed up their ideas between lime and limestone, water mixes with the lime, expanding, and down goes another mountain.

To give the real cause, however, is a matter of conjecture as there may be the two tributary causes combined or only one of these acting.

Some fissure in the mountain, with the warm opening days of spring and a hard night's frost, as it was, may have caused the movement alone, or the loosening of the coal in the mine with very little support on the lower side caused the overlying mass to break away. These alone, or combined, caused the great rock slide at Frank which has awakened the world.

FRANK B. SMITH, B.Sc., M.E.,  
*Inspector of Mines.*

CALGARY, 7th May, 1903.

The disaster which overwhelmed Frank is certainly the most weird and terrible one could think of. On the morning of the 29th, at about 4 a. m., a rock slide came down which covered with debris the whole width of the valley, and spread down along its length for a distance of nearly two miles, burying all and carrying all in its wild rush.

Turtle Mountain is about 2,000 feet higher than the flat or valley at its base. It overlooks, and one might say it towers above, Frank, standing bold and fearful as a sentinel.

Its slope is steeper towards the top, the last 1,000 feet having certainly an inclination of 60°. The formation is limestone, with a westerly dip of from 40° to 60°; in other words, the strata dip into the hill.

A look at the hill will now show a great gap or cavity. The portion which gave way would be represented by a mass of limestone at least 1,200 feet long by 1,000 wide, by 500 thick. This great mass, becoming detached in an instant, slid down with fearful velocity, carrying everything along with it, scooping out in its passage the boulders, filling the bottom of the valley and spreading these along its run, thus increasing, to a great extent, its destructive action.

This is easily proved by the fact that the outer edge of the debris is composed of more or less rounded sandstone boulders, while the actual rock slide is made up exclusively of limestone, and forms the centre.

The avalanche, as it came down, passed over the coal mine at Frank, buried up the main entry and all its communications with the surface. It carried away tippie, blacksmith shop, stable, six cottages belonging to the coal company, besides several shacks in the valley below the town. It covered about 1½ miles of the C. P. R. with a thickness of at least 100 feet of rock; also some ¾ of a mile of track belonging to the Frank and Grassy Mountain Railway, the property of the Lille Collieries, which operates a coal mine 4 miles up a tributary valley.

Under the slide are buried some 80 people, a great proportion of which are women and children, as all of the 6 cottages of the company were occupied. Among the missing are the few men at the tippie and loading cars. Very few of the bodies have so far been recovered.

At the time there were 19 men in the mine; two of them were near the mouth of the entry, and are missing. The other 17 were inside the mine.

These tell of a great shock and noise, a cracking and squeezing of timbers. Their first idea seemed to be that an explosion had occurred. They made straight for the mouth of the main entry, but found that caved in. They climbed up the rooms to some raise connecting with the surface; everything was blocked. They finally decided to make their way out through the outcrop coal. After digging some 50 feet they succeeded in reaching daylight 12 hours after the accident occurred.

It happens that the seam where it outcrops along the side of Turtle Mountain is not covered by debris to any extent. The momentum of the mass of falling rock has carried it away and past the mine. The main entry itself, however, is deeply buried.

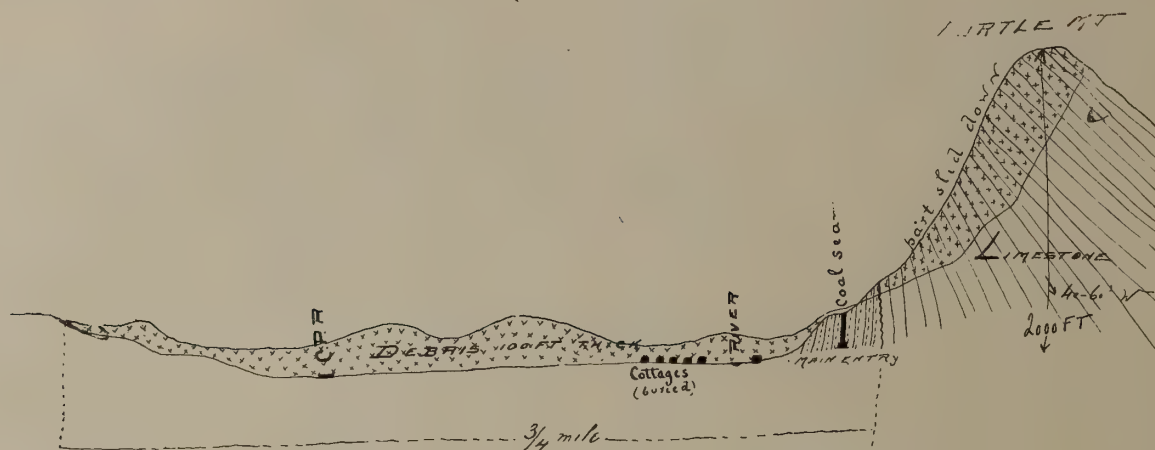
The blocking of the valley shut out all outlet for the river. It rose and formed a lake near the mine. Fortunately it has since found a channel, having reached the top of the debris, so all danger of flood is gone.

People awake at the time of the accident say there was a great noise, then a crash, accompanied by a trembling of the earth, as the mass of limestone slid into the valley beneath. Even at Lille Collieries, 4 miles distant, the shock was so great as to awaken everybody. All the following day rocks kept falling down in smaller masses. To-day, May 3rd, everything is quiet, but the danger, according to competent authorities, is far from past.

In order to ascertain the probability of any further sliding, a party was sent up to the summit of Turtle Mountain. This consisted of Mr. F. B. Smith, mine inspector; J. MacArthy, manager Frank



## THE FRANK DISASTER.

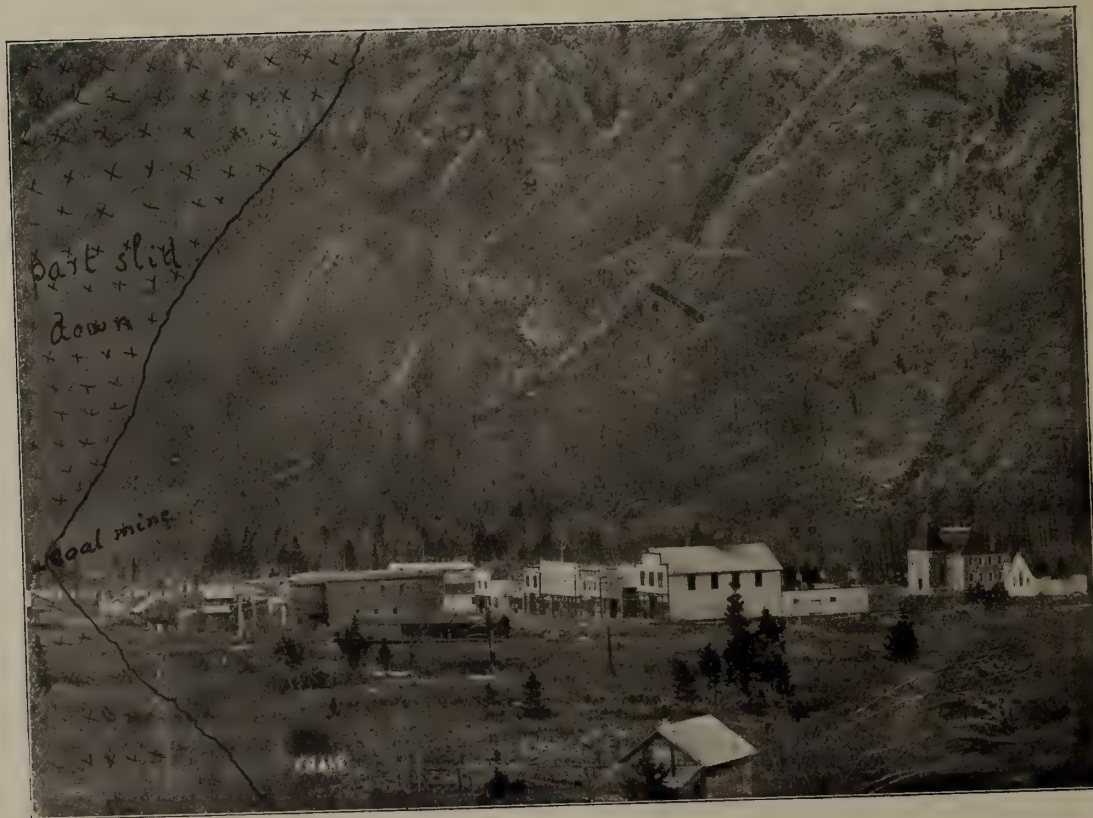


SKETCH SHOWING ROCK SLIDE

AT FRANK, ALBERTA—

APRIL 29<sup>th</sup> 1908

*Paul J. Jones*



The Town of Frank, Alberta, showing location of Canadian-American Coal and Coke Company's Colliery before the disaster.



THE FRANK DISASTER.



Showing Coal Chutes from mouth of the Colliery previous to the slide.



Showing Mine Entry, Railway, Coal Chutes, Coking Ovens, etc., before the disaster.



## THE FRANK DISASTER.



Showing Turtle Mountain after the slide, the lower end of the Town completely submerged in the mass of rock.



Showing remains of back row of cottages and foot of mountain where entry to mine was located. Two or three miles of country completely covered with a mass of rock in many places to a depth of two hundred feet or more.



## THE FRANK DISASTER.



Another view of the mountain after the disaster. Old Man River filled with rock. X shows where the miners worked their way out after a whole day's digging. XX shows where rescue party endeavored to release them.



This view gives an excellent idea of the immense rock masses dislocated and hurled about one and a-half miles from mountain.



## THE FRANK DISASTER.



Picnic and Ball Grounds, Frank, Alberta. Taken in September, 1902, on the first anniversary of the opening of the town.



The same after the disaster.



THE FRANK DISASTER.



General Manager McCarthy on top of the mountain examining into cause of continued rock falling.



Taken from the top of the mountain looking across the chasm.



Searching for bodies.



Mine (Canadian-American Coal and Coke Co.) and Mr. F. L. Byron. They found the summit of Turtle Mountain fissured in all directions, particularly that part overlooking Frank. Some of the fissures were of unknown depth and over 20 feet wide. As a consequence, everybody was strongly advised to leave town. The state has provided transportation free to anybody who wishes to leave. The result is that to-night the town of Frank is deserted.

Right here let there be a word said of the hospital corps. Amidst all the confusion and excitement attending the removal of the wounded and maimed, they kept a self control that was remarkable and precious; of the miners and business men who toiled hard and patiently over the debris of their ruined cottages, hoping and fearing for their dear ones' sake.

Traffic is completely blocked from the east. It will be at least two months before the C. P. R. can lay down a temporary track, and a great deal more before everything is in good running order.

As to the future of the Frank mines, no one can exactly tell. There is no positive evidence as to their condition. The men that were inside at the time say there was cracking of timbers and some fall of rock, but as all of them were nearly in the same part of the mine, their evidence is not one to be greatly relied upon.

There is no doubt there has been some falling of rock and some squeezing of the walls; in fact, the very movement of the walls was probably the primary cause of the accident, as will be explained later, though what the extent of the movement is nobody can at present vouchsafe.

All sorts of theories have been advanced as to the cause of the slide. That limestone mass fell down either because of natural disintegration at its base, until insufficient support was left for the great mass above, or because an empty space having been formed underneath it by the mining out of the coal, subsidence of the roof occurred, loosening and starting the superimposed strata. The last represents exactly the conditions obtaining at the mine. (See sketch.)

Here we have a vertical seam 12 feet to 16 feet wide, approximately parallel to the general stratification of the limestone in the hill above it; rooms averaging at least 100 feet long, running up the pitch to the outcrop, with 20 feet pillars between. At first the coal was allowed to stay in the rooms, keeping them full, the surplus only being drawn out, but lately a considerable number of old rooms have been partly emptied. As has been said before, nobody is yet in a position to assert there has been a general subsidence of the walls. This point cannot be settled until an examination of the mine is made. In any case the catastrophe involves large losses, both in life and property.

The mine was shipping on an average about 600 tons per day. The coal was conceded to be of excellent steaming quality. It could be mined exceedingly cheap, rather less than \$1.00 per ton, and found a ready market with the C. P. R. Whether an effort will be made to re-open the mine or not is unknown at this date. Other mines in the immediate vicinity are nearing the producing stage, and will be in a position to supply the demand for coal, which is rapidly making itself felt in the neighborhood.

RAOUL GREEN.

FRANK, ALTA., 11th May, 1903.

Mr. J. Obalski, Inspector of Mines, has issued his annual report reviewing the progress of mining in the Province of Quebec during the year 1902. Mr. Obalski very conservatively estimates the value of the mineral production during that period at \$3,000,000. About 5,000 persons are employed by this industry. Much serviceable information is given by Mr. Obalski concerning the asbestos, mica, chromite, graphite, copper and other working mines.

## EN PASSANT.

In view of the very regrettable abandonment of the proposed visit of the American Institute of Mining Engineers to British Columbia, the Canadian Mining Institute is endeavoring to get the American engineers to visit Toronto early next year. In this event a joint meeting of both organizations will be held and a series of excursions to the nickel, copper, iron and gold mining regions of Ontario carried into effect.

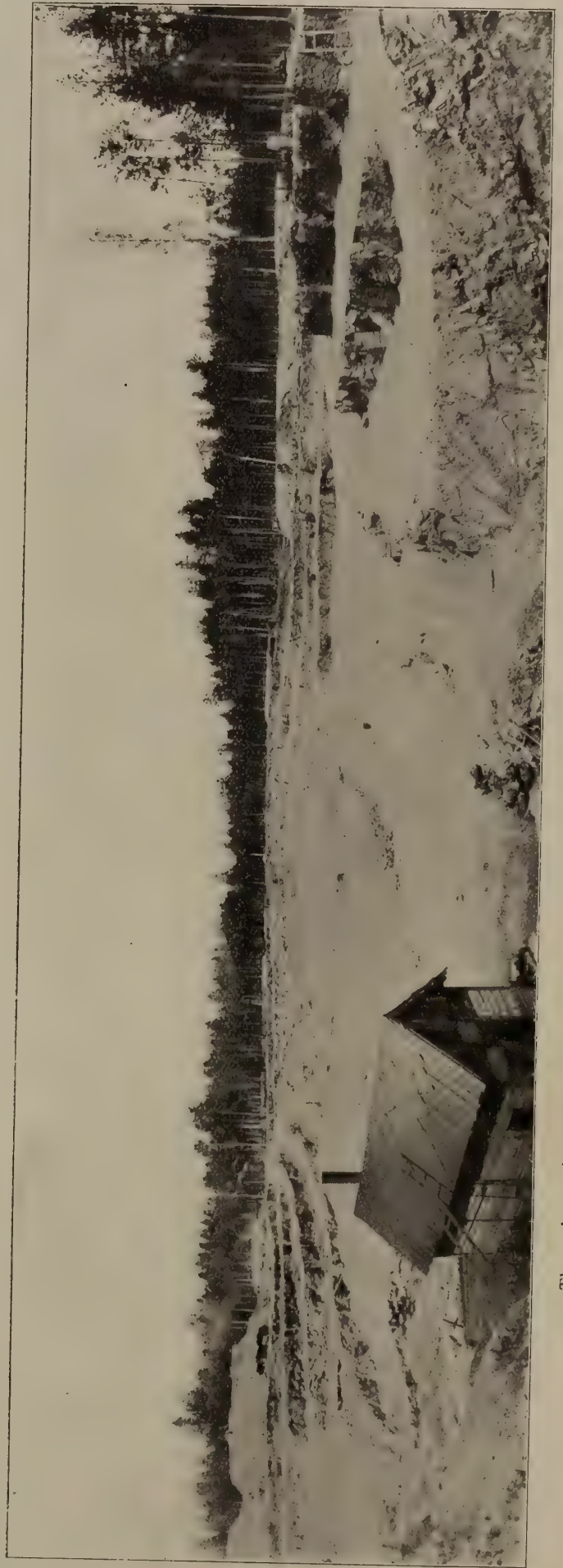
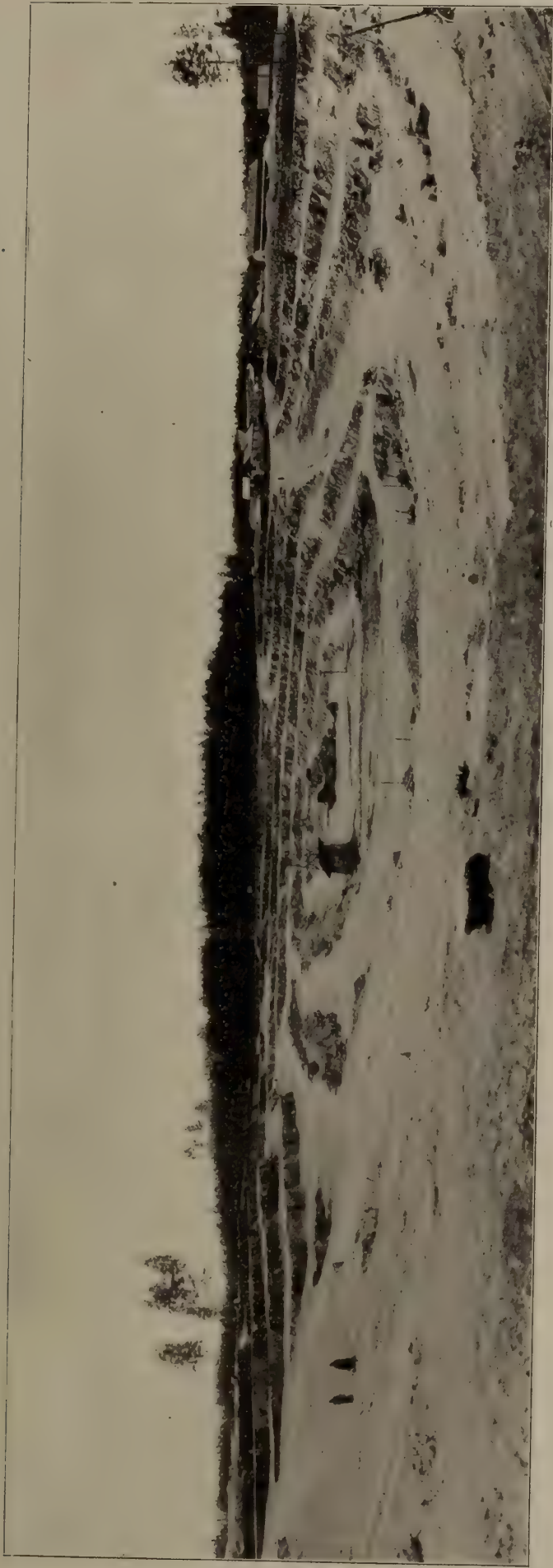
In this issue we reproduce the two very fine panoramic views of asbestos mining in Asiatic Russia. Mr. H. C. Riehle, mining engineer of the Union Asbestos Mines, Black Lake, Ont., to whom we are indebted for these photographs, gives the following particulars of this industry which, to some extent, competes with our own asbestos production in the Province of Quebec:—"The views are of the 'Corewo' and 'Baron Girar de Soukanton' Asbestos Mines, situate in Asiatic Russia. These mines are remarkable for the fact that even with a production of 1500 to 1700 tons of asbestos per season, the mining work is all done without the aid of machinery or explosives. The rock is essentially a serpentine, but is quite decomposed to a depth of about 45 feet, so that it resembles a clayey gravel. The ground carries more asbestos to a given area than our Canadian mines, but the veins are not so heavy nor of so white a colour as our output. Again, our veins generally appear as 'twin veins,' while the Russian veins are only single veins. Mining operations are all carried on upon very antiquated systems, while proper milling plant, practically does not exist. Experiments in milling are, however, in progress, and are very vivid reminders of what occurred at the Quebec mines years ago. The working force at these mines numbers up to 1700 men in the season (*i.e.* each mine) and is recruited from the Russian Mujiks or peasants. The wages paid ordinary labour is about 33 to 38 cents a day, with free sleeping quarters. These mines also suffer from a scarcity of labour during the harvesting time, same as the Canadian mines do. Adjacent lakes will prevent these mines from ever attaining the depths of our mines owing to the very porous nature of the earth—the lakes being on nearly the same level as the mines."

The announcement by the Finance Minister that the Government has removed the duties on mining machinery going into the Yukon and Atlin will be received with satisfaction by the operators in these somewhat remote but important mining regions of the Dominion.

Dr. Eugene Haanel, Superintendent of Mines, contributes to the annual report of the Minister of the Interior, an exceedingly interesting and valuable review of the progress of mining in the Yukon which we heartily commend to those of our readers who are interested in this productive gold territory. After very fully describing the various mines which he inspected last summer and commenting upon the improved methods of mining which are gradually superseding the older workings, Dr. Haanel concludes:—"The first workings of the claims of Bonanza and Eldorado creeks by the cruder methods of earlier years have been so wasteful that it has been found to pay to work them a second time, and some claims have yielded, on second working larger returns than on first working. Many of these claims are now worked out 'from end to end and rim to rim, and are fit for nothing else than dumping ground.' No claims on the other creeks, as far as I could ascertain, are being worked a second time, nor is it likely that it would prove profitable to re-work them, since the methods of extracting the gold have greatly improved, and care is exercised to get out maximum percentage of the 'pay.' It must not, however, be



ASBESTOS MINING IN ASIATIC RUSSIA.



These photos give a panoramic view of the "Corewo" and "Baron Girar de S ukanton" Asbestos Mines in Asiatic Russia.



overlooked that there are long stretches of creek bottom and gulches, which, being of too low a grade to be worked by ordinary placer-methods, can be worked profitably on a large scale by machinery. Many claims, which are 'good pay,' are held back for lack of water, awaiting the exhaustion and relinquishment of adjoining claims to enable the owners to take advantage of the water now being used by their neighbours. Still other claims are held back, awaiting improved conditions as regards transportation, labour and fuel. To this ground now lying idle must be added the hillsides awaiting to be worked by hydraulicking. But whatever generous estimate may be made as regards the quantity of gravel still to be worked in the Klondike, this gravel will be worked on a large scale by the more rapid methods of machinery, employing comparatively few men. It is quite probable that other auriferous regions may be discovered in the Yukon, which will develop into placing-mining camps,—we know very little as yet of the resources of the Yukon,—but such discoveries will simply shift the population to the new mining camp. That this is realized, and that it is understood that the Klondike as a mining camp must look for permanency to the discovery of paying quartz and in paying quantities is evidenced by the energy manifested by prospectors in searching for quartz. Very many quartz locations have already been staked and recorded."

The removal of the duty on mining machinery imported into the Yukon is a wise measure which cannot fail to stimulate the development of mining in the Yukon on a larger scale than has been.

The sixth annual report of the Crow's Nest Pass Coal Company reproduced elsewhere, shows, notwithstanding the losses entailed by the lamentable explosion and an unfortunate strike, which greatly retarded the Company's output of coal and coke, that substantial progress has been made. Four dividends of  $2\frac{1}{2}\%$  each, or ten per cent. for the year, were paid. To date the dividends paid by the Company have been:—

|        |             |
|--------|-------------|
| No. 1— | \$55,205 50 |
| No. 2— | 62,500 00   |
| No. 3— | 62,500 00   |
| No. 4— | 62,500 00   |
| No. 5— | 62,500 00   |
| No. 6— | 62,500 00   |
| No. 7— | 62,500 00   |
| No. 8— | 62,500 00   |

or total dividends of \$492,705 50

During the year ended 31st December, the net profits, notwithstanding the strike and explosion, amounted to \$171,285.80.

Vol. VI. of the Journal of the Canadian Mining Institute is rapidly being printed and will be in the hands of the members, it is hoped, early in July. This volume will contain about 600 pages and over a hundred illustrations.

The Lake of the Woods gold district has again to record another dismal failure, through mismanagement, in the winding up of the Mikado Gold Mining Company. The London *Critic* severely handles the directors of this concern in an editorial under date of 25th ultimo, from which we quote:—

"Colonel Engledue (C.B.B.), who presided at the meeting to consider these accounts in May, 1900, did not, of course, dilate to the shareholders on the bankrupt position of their undertaking. He fixed their attention on their holding of Mikado shares; and painted the shareholders prospects in *couleur de rose*. He announced that £1,400 had just been received as divi-

dend on the Mikado holding, and pictured profits coming in from this source at the rate of £3,000 per month, so soon as the mine was equipped with additional plant, to defray the cost of which the shareholders of the South African General Development Syndicate were to be asked to subscribe. The simple shareholders, as a matter of course, swallowed the honeyed words of their guinea-pig chairman, and instead of cursing the Board for the awful accounts presented, went away blessing them. Doubtless many of them also went home and wrote out applications for the new issue of Mikado shares.

"Since the meeting of May, 1900, the shareholders of the South African General Development Syndicate have received no further report and accounts from their directors; but as shareholders in the Mikado Gold Mining Company, they have been in touch with the syndicate's most attractive investment. It was a peculiar coincidence that, almost immediately after the dividend above referred to had been paid and some 22,500 new shares had been subscribed, the character of the Mikado gold mine changed: There was, to quote the last report of the directors, 'an unexpected fall in the value of the ore which could not be foreseen, as will be understood by those acquainted with gold mining.' The falsification of the roseate promises of Colonel Engledue and his henchmen will certainly be readily understood by all who have had the misfortune to be interested in their many unfortunate companies.

The Mikado property, so far from proving highly profitable in accordance with the directorial promises, has been mined at a serious loss. The dividends, to the amount of £2,250, distributed in the spring of 1900, when the new issue of 22,500 shares was being made, were clearly paid out of the capital inasmuch as had the mine development expenses been charged to revenue instead of to capital, there would have been a heavy balance on the wrong side of the accounts at that time. And the position at present is that the whole of the subscribed capital has been frittered away, besides some £80,000 of gold extracted from the property, and that the company, by reason of its liabilities, cannot go on unless further capital be forthcoming from somewhere. The directors tried to raise £12,500 by an issue of debentures in January last. But there was no response to their circulars offering the bonds, and it is to be hoped that they will meet with no more success with the proposals which they have now put forward to form a new company to take over the Mikado undertaking with a capital of £75,000 in £1 shares, credited with 15s. paid. Even if payable ore were again found on the Mikado property, the shareholders have no reason to believe, from their past experience, that it would prove profitable to any but the directors and officials. The obvious course, therefore, for the fleeced shareholders in the Mikado Company and its parent concern (the South African General Development Syndicate) is to have the wretched venture wound up—and the winding-up should be compulsory, under the supervision of the Court."

Just as we go to press we have received from The Carswell Company, Limited, of Toronto, an advance copy of the Hon. Archer Martin's handsome volume of "Mining Cases" decided by the Courts of British Columbia and the Courts of Appeal, from 1853 to end of September, 1902. This is, we understand, the first of what is to be a series of B. C. mining reports, revised and collected together in such a manner that the enquirer into the state of the law affecting mining rights and property can readily, conveniently and accurately inform himself on any branch of the subject without having, at great loss of time and labour, to wade through several series of disconnected reports, thus incurring the constant danger, even to the practitioner skilled in mining legislation, of overlooking some important decisions.

To facilitate reference and minimize the danger of mistakes, annotations and cross-references are given at the end of each case, and full explanatory notes where necessary. Great difficulty being constantly experienced in tracing up through many volumes of statutes, often un-indexed, the law applicable to mining claims located in different years under different laws, it has, at the request of many leading counsel, been decided to include, in the form of an appendix, a verbatim reprint of all mining statutes, so far back as to cover the title to every existing mineral claim in the province, and also a selected few of the earliest gold laws and proclamations, so as to show and explain the origin and development of B. C. mining legislation. Also there



has been compiled a table or list of every proclamation, ordinance, law, statute or regulation issued since the first one in 1853.

While, of course, this eminently serviceable work will have the greatest value to the legal profession, it will be of unquestioned usefulness to mining engineers and mine managers interested in British Columbia. The price of the book is \$20.00, bound in half calf.

The Ontario Bureau of Mines has issued a very timely bulletin on "Peat Fuel, its Manufacture and Use," by Mr. W. E. H. Carter, B.A.Sc., Secretary of the Bureau, who for this purpose visited almost all the peat factories of the Province and investigated the efficiency and cost of the machinery and methods made use of. Discussing the question of price Mr. Carter says: "The cost of producing 'machine' peat in Europe is from 85 cents to \$1.35 per ton; of peat briquettes \$2.15 per ton. As the detailed data set out in the following pages show, peat briquettes can be made in Ontario at about \$1.00 per ton of 2,000 lbs. Allowing a suitable margin for profit, interest on investment, etc., it is evident that compressed peat fuel can be sold at the place of production for \$3.00 per ton, and at a correspondingly greater figure if railway freights have to be paid. As a matter of fact, it has already been sold by one maker for two successive seasons at \$3.00 per ton, and beyond doubt in this price was included a fair profit. Putting the theoretical value of peat briquettes at two-thirds that of coal, at \$3.00 per ton their cost would be equivalent to anthracite at \$4.50 per ton, and at \$4.00 per ton to anthracite at \$6.00 per ton. Such figures at once bring peat fuel into the economic arena, as it may be doubted whether with the effective control now exercised by the trusts over the production and sale of anthracite, we are likely to see it again drop to a lower retail level than \$6.00 per ton. In the light of the facts brought out in this report, it will be surprising if the citizens of Ontario are not soon given their choice between compressed peat fuel and coal, instead of as at present being confined entirely to the latter." The report covers the ground very thoroughly and gives a great deal of useful information on the subject.

### Molybdenite—Its Occurrence, Concentration and Uses.

BY J. WALTER WELLS, M. E., Kingston, Ont.

As the uses of mineral molybdenite are being extended the writer undertook some experimental work at the ore-dressing laboratory of the Kingston School of Mines to determine the different methods of concentrating its ores and it was thought that the results might be of interest to the members of the Canadian Mining Institute.

Molybdenite when pure contains 60 p.c. molybdenum and 40 p.c. sulphur and may be represented by the formula  $\text{MoS}_2$ . A sample selected by the writer from an Ontario specimen carried carried—

|                              |                  |
|------------------------------|------------------|
| Mo.....58.56 p.c.            | S.....38.34 p.c. |
| SiO <sub>2</sub> .....0.32 " | Fe.....0.79 "    |

It is commonly found foliated, massive in scales or finally granular. Sometimes it is found in nature as hexagonal crystals more or less tabular or as short tapering prisms horizontally striated.

The cleavage is basal, the laminae being very flexible but not elastic. It may be easily cut with a knife the hardness being 1 to 1.5. Its specific gravity is 4.7. The lustre is metallic and the color a lead to silvery gray. It is opaque, and very greasy leaving a gray-blue trace on white paper. It closely resembles graphite in softness and physical structure but gives a bluer trace on paper and shows sulphur reaction with soda on charcoal. The difference in graphite and molybdenite was pointed out by Scheele in 1778.

Heated on charcoal molybdenite gives a strong odor of sulphur with the oxidizing flame coating the charcoal with molybdenum dioxide which is yellow while hot and white on cooling. If the white coating

be touched with a reducing flame it gives a beautiful blue color along with a copper-red. Molybdenite is infusible in the blow-pipe flame imparting a greenish-yellow color to the flame. It oxidizes in the open tube giving sulphurous fumes and a yellow sublimate of molybdenum dioxide. It is decomposed by nitric acid and more readily by a mixture of nitric acid and potassium chlorate, leaving a white residue of molybdenum dioxide, soluble in water, the solution when reduced with zinc and sulphuric acid turning a blue, green and finally on olive brown.

#### OCCURRENCE OF MOLYBDENITE IN CANADA.

Molybdenite seems to be a common mineral in Canada judging from reports. It is commonly found associated with other sulphides such as pyrite, pyrrhotite, and chalcopyrite. At the Giant mine, Rossland camp, British Columbia, the gold values seem to depend on the amount of molybdenite present. According to Hon. C. H. McIntosh as reported in *Rossland Miner*, Feb., 19, 1903, a sample of ore from the Giant mine rich in molybdenite sent to Vivian & Co., Swansea, England for analysis carried the following:—

|                          |                 |
|--------------------------|-----------------|
| Molybdenum.....          | 24.20 per cent. |
| Nickel.....              | trace.          |
| Cobalt.....              | 1.00 "          |
| Bismuth.....             | .19 "           |
| Arsenic.....             | 1.80 "          |
| Sulphur.....             | 23.00 "         |
| Copper.....              | trace.          |
| Lead.....                | trace.          |
| Zinc.....                | nil.            |
| Antimony.....            | nil.            |
| Silica.....              | 35.00 "         |
| Iron-metallic.....       | 12.00 "         |
| Lime, magnesia, etc..... | 2.30 "          |

99.49

Gold—4.14 ounces per ton of ore.

Silver—1.2 ounces per ton of ore.

Molybdenite is often found in quartz veins where its presence does not indicate the presence of gold according to assays made by the writer. It is a common accessory mineral in granites, gneiss, pegmatites, etc. The report of the Canadian Geological Survey note the following localities where molybdenite may be found:—

1. At the mouth of Burnt Hill brook, a branch of the south west Miramichi, New Brunswick, where the molybdenite was found in quartz veins cutting schistose rocks but not in commercial quantity.
2. In quartz veins at various point along the Atlantic coast in Cape Breton.
3. In quartz veins cutting granite near Gaspereaux Station, New Brunswick.
4. In quartz veins at Pennfield, Charlotte County, New Brunswick, 2 miles north of the post road on Trout brook where the quantity is said to be considerable.
5. In syenite near Gaspereaux river road in New Brunswick
6. At lot 12, 12th concession of Templeton, Quebec, intermixed with pyrite.
7. At lots 1 and 2, 3rd range of Aldfield Township, Pontiac County, Quebec.
8. At lot 69, 4th concession of Egan Township, Ottawa County, Quebec, where there is said to be a large deposit associated with pyroxene, mica, pyrite, etc, carrying 7.5 p.c. molybdenum dioxide.
9. At lot 7, 9th range of Ross Township, Renfrew County, Ontario, where a vein carries molybdenite associated with apatite, scapolite, titanite, pyrite, etc.
10. In Matawanchan Township, Renfrew County, Ontario, the locality being not well defined.
11. At lot 22, 2nd range of Ross Township, Renfrew County, Ontario, where a quartz vein in gneiss is said to carry considerable molybdenite.
12. At Quarry Island, Rainy River District, Ontario, where the gneiss as country rock shows specks of molybdenite.



13. Around Lake Nipissing, Ontario, as an occasional constituent in quartz veins.

14. A specimen is reported from upper Cowitchen river, British Columbia.

15. In association with copper ore at a locality between Jarvis, Inlett and Howe Sound, British Columbia.

16. In the Atlin district it may be found as an accessory constituents of gneiss and in quartz veins especially at the head of Volcanic creek.

17. Float carrying considerable has been found in the vicinity of Great Slave lake.

According to the Inspector of Mines for Nova Scotia specimens of molybdenite may be found in that province of Gabarus, Hammonds, Plain Bedford, Lower Musquodoboit, New Germany and New Ross.

The Inspector of Mines for Quebec reports molybdenite in workable quantity in quartz veins at Quetcho-Manicougan: at lot 17, 15th concession of Leeds Township, Megantic county: at the northern part of 13th range in Calumet Island.

According to the reports of the Bureau of Mines for Ontario molybdenite may be found more or less abundant at the following localities:—

1. Lot 3, 8th concession of Miller Township, Frontenac County.
2. At Black river, Lake Superior region where a considerable quantity is reported.
3. At lot 14, 5th concession of North Crosby, Leeds Township.
4. At lots 26 and 27 in 6th concession, Monteagle Township, Hastings County.

5. Near Farquhar lake in lot 3, 1st concession of Harcourt Township, Haliburton County, where a considerable deposit has been opened up by the Haliburton Land and Immigration Co. of Toronto. Five veins traversing pyroxenite as country rock have been exposed carrying molybdenite with pyrrhotite, tremolite, pyrite, mica and sphene. The total exposure is 300 yards long and 80 yards wide on which test pits have been sunk. Average samples from this property carry about 2 p.c. molybdenum.

6. Several localities are reported where the molybdenite appears to be only an accessory mineral in country rock or pegmatites.

The writer also knows of the following important deposits not mentioned as they are but recently discovered:—

1. At the centre part of lot 5, 11th concession of Laxton Township, Victoria County, Ontario, near Mud Turtle lake. Development work done by the owner, Mr. J. Webber, Toronto, shows a vein about 15 feet wide cutting crystalline limestone. The vein has been stripped for 40 feet by an open cut and shows molybdenite in large and small flake associated with pyroxene, calcite, quartz, black mica, pyrites, a few specks of pyrrhotite and hornblende. A 50 lb. sample submitted to concentration tests as further described carried 3.28 p.c. molybdenum.

2. At the south part of lot 5 in the same locality as (1) where a narrow vein carrying molybdenite may be traced 5. Three pits sunk about 30 feet apart show molybdenite in considerable quantity and fairly rich. The associated minerals are quartz, calcite, pyrite, molybdenum ochre due to weathering action and pyroxene.

3. On the farm of T. Dwyer, Sheffield Township, Addington County, there is a mineralized zone carrying pyrrhotite, pyrite, hornblende, calcite, quartz, pyroxene, black mica, etc., in which foliated masses of molybdenite occur some of the masses being 6"x6" while it may be as fine flakes.

Development work done by the owner, Mr. A. M. Chisholm of Kingston, has produced a pile of 1,000 tons of ore and the deposit does not seem to be exhausted. Average samples selected by the writer carried 2.8 p.c. Mo and 260 lbs. of selected ore subjected to concentration carried 3.90 p.c. Mo.

4. A deposit is known to occur near Granite crossing, British Columbia, where the C. P. R. crosses Kootenay river. Five claims have been taken up by Mr. T. L. Stamford of Nelson, on a vein mostly quartz traversing altered granite as country rock. The molybdenite occurs as fine flakes in the quartz and there is more or less of reddish feldspar present. A 20 lb. sample from this locality submitted to concentration tests by the writer carried 1.5 p.c. Mo.

Molybdenite is reported to have been found in considerable quantity at Rencontre, Fortune Bay, Newfoundland.

A deposit has been found near the White pass Tunnel above Skaguay in the Yukon Territory carrying considerable molybdenite with high gold values.

#### CONCENTRATION TESTS ON CANADIAN MOLYBDENITE ORES.

Molybdenite has come into industrial use only within the last few years on a large scale so that there is practically no literature regarding the methods of concentration or dressing its ores. As it is a common mineral in Canada and its industrial uses appear to be increasing, some commercial method of extracting the mineral from its ores is needed. Accordingly the writer submitted several samples to concentrating tests at the ore-dressing laboratory of the Kingston School of Mines with the object of finding a simple and efficient method of concentrating molybdenite from the low grade ores.

Sample A comprised 260 lbs of ore from a deposit in Sheffield Township, Addington County, Ontario, already noted. Plate 1 is a characteristic specimen showing the flakes of molybdenite segregated in the matrix. The sample carried about 50 p.c. pyrrhotite, 10 p.c. pyrite intermixed with calcite, black mica, quartz, pyroxene, etc. The sample carried 3.90 p.c. Mo. equivalent to 6.5 p.c. molybdenite. All

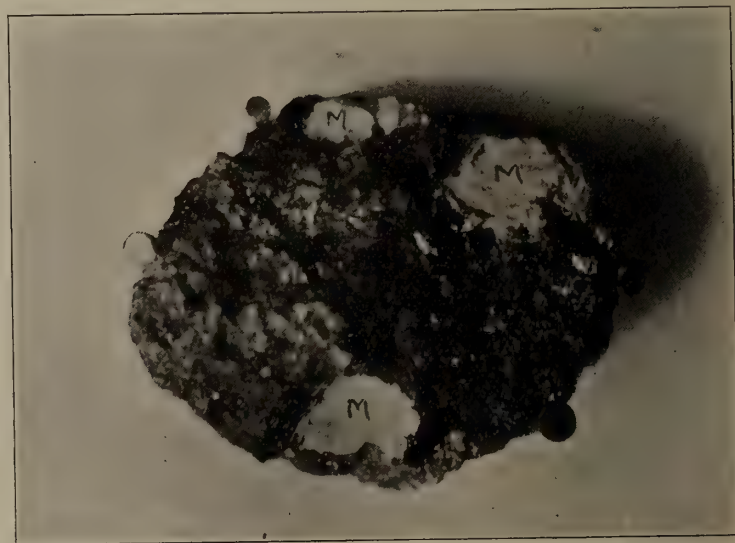


Photo showing Molybdenite in flakes (M) found in Pyrrhotite.

of the molybdenite was in the form of small scales or segregated masses as the ore was selected to see what could be done with the fine flakes. Hand picking of the large flakes is obviously the easiest method of securing a marketable product but the removal of the fine flakes is more difficult.

The sample was crushed in jaw crusher, passed through rolls and screens with slots of 0.20" diameter. Molybdenite as large flexible flakes not reduced in size by rolling was picked from the screen. Such ore weighing 3 lb. carrying 54.3 p.c. Mo equivalent to 90.05 p.c. molybdenite.

The ore was then crushed in the rolls to finest possible size and passed through the screen of 0.20" diameter delivering an oversize weighing 3.5 lb. consisting of mica and molybdenite with a few particles of pyroxene. Neither mica nor molybdenite were much affected by passing through the fine rolls owing to the flexible and laminated structure.



A few particles of the molybdenite had particles of pyrite and pyrrhotite imbedded in the soft flakes. The ore passing 0.20" screen was passed to screen delivering product of 0.10" diameter and finer while the oversize consisting of mica, molybdenite with a few particles of rock weighing 4 lb. in all was removed. The ore reduced to 0.10" size was passed through a Wetherill magnetic separator removing 134 lbs. of almost pure pyrrhotite as a magnetic product showing by analysis:—

|                 |                             |
|-----------------|-----------------------------|
| Fe.....         | 60.30 per cent.             |
| Sulphur.....    | 38.97 "                     |
| Nickel.....     | 0.34 "                      |
| Molybdenum..... | traces.                     |
| Cobalt.....     | traces.                     |
| Platinum.....   | traces.                     |
| Copper.....     | traces.                     |
| Gold.....       | 0.04 ounces per ton of ore. |
| Silver.....     | traces.                     |

The tails from the magnetic separator carry:—

|                 |                |
|-----------------|----------------|
| Sulphur.....    | 5.49 per cent. |
| Nickel.....     | traces.        |
| Molybdenum..... | 0.46 "         |
| Copper.....     | traces.        |
| Gold.....       | traces.        |
| Silver.....     | traces.        |
| Platinum.....   | traces.        |

The tails from the magnetic separator passed through a straight line hydraulic separator delivered heads carrying—

|              |           |                 |           |
|--------------|-----------|-----------------|-----------|
| Sulphur..... | 5.08 p.c. | Molybdenum..... | 0.34 p.c. |
|--------------|-----------|-----------------|-----------|

to a Wilfley table while the tails consist largely of mica, crushed particles of rock with a few flakes of molybdenite.

The Wilfley table give a head product weighing 11 lb. carrying—

|              |            |                 |           |
|--------------|------------|-----------------|-----------|
| Sulphur..... | 41.93 p.c. | Molybdenum..... | 1.32 p.c. |
|--------------|------------|-----------------|-----------|

being mostly pyrite fit for making sulphuric acid. The middles from the Wilfley samples as being returned to the table for retreatment carry—

|              |           |                 |           |
|--------------|-----------|-----------------|-----------|
| Sulphur..... | 3.64 p.c. | Molybdenum..... | 0.12 p.c. |
|--------------|-----------|-----------------|-----------|

While the tails carry—

|              |           |                 |           |
|--------------|-----------|-----------------|-----------|
| Sulphur..... | 2.74 p.c. | Molybdenum..... | 0.10 p.c. |
|--------------|-----------|-----------------|-----------|

neither being of any commercial value but showing that the Wilfley table is adapted to the ore for removing the pyrite if it is necessary or profitable to do so. The object of removing the pyrrhotite as one product was to get an ore of nickel if possible but there is not sufficient nickel present to make it worth while so that probably the pyrite and the pyrrhotite might better be separated on the Wilfley as an ore of Sulphur.

Attempts were made to remove the molybdenite from the Magnetic separator tails using a modified form of the Elmore oil process mixing the ore with heavy oil and passing to a spitzkasten where the rock should fall allowing the particles picked up by the oil to float off. The oil seemed to have a selective action on both the pyrite and the molybdenite so that no clean product could be got: besides the larger flakes of molybdenite were not picked up by the oil.

The oversize from the 0.20" screen was treated in a hand jig calculated to give the same results as a Hartz jig. A sample carrying 55 p.c. molybdenite and 45 p.c. mica gave a product carrying 85 p.c. molybdenite with only a small loss as floating particles in the tails owing to a large size of the particles.

A cleaner separation of a similar sample was obtained by treating in a Wetherill cross-belt separator for weakly magnetic material removing the black mica as a magnetic product leaving molybdenite 90 p.c. pure.

A few flakes of molybdenite go into the magnetic heads owing to imbedded particles of pyrrhotite in the soft molybdenite due to the fine crushing of the rolls. It was found that the imbedded particles of pyrrhotite could be removed by treating in tumbling barrels.

The oversize from 0.10" screen carrying 48 p.c. molybdenite, 45 p.c. mica with a little hornblende or pyroxene was treated in a

hand jig giving a product carrying 70 p.c. molybdenite with a considerable loss as slimes.

Oil concentrating was tried on a similar sample with poor success as the larger particles of molybdenite were not picked up by the oil.

Magnetic separation gave the best results as all the mica was removed leaving molybdenite 91.10 p.c. pure. The same trouble of magnetic pyrites imbedded in the soft molybdenite was noted.

As molybdenite resembles graphite in many physical characteristics it was thought that a scheme of crushing and treating with Hooper pneumatic jigs such as used in treating flake graphite would give a clean product, but unfortunately the writer had not the use of one of these air jigs. Graphite has a specific gravity of 2.1, while that of molybdenite is 4.6 so that in some cases it may be seen that molybdenite cannot be separated clean from some of the associated minerals of the same specific gravity. The makers of the Schule dry concentrator successful on the ordinary run of ores report to the writes that they have not been successful so far in removing molybdenite from a gangue of hornblende and mica.

The following scheme of treatment being the result of experiments is probably the most suitable for this ore:—

Hand cobbled ore.

↓  
Jaw crusher (0.50")—Hand picking of large flakes of molybdenite detached.

↓  
Rolls (0.20")

↓  
Screen (0.30")—+oversize—(mica and molybdenite.)

↓  
Screen (0.20")—+oversize (mica and molybdenite also a little rock.)

↓  
Screen (0.10")—+oversize (mica, molybdenite, rock matter.)

↓  
Screen (0.05")—+oversize (mica, molybdenite, rock.)

↓  
Wilfley table to save the Pyrite and Pyrrhotite as an ore of Sulphur.

As none of the oversize products from the screens were of commercial grade, experiments were made to ascertain the simplest method of cleaning them.

The oversize from 0.20" screen was pulverized to pass 0.05" screen and passed to Wilfley table which delivered a head product

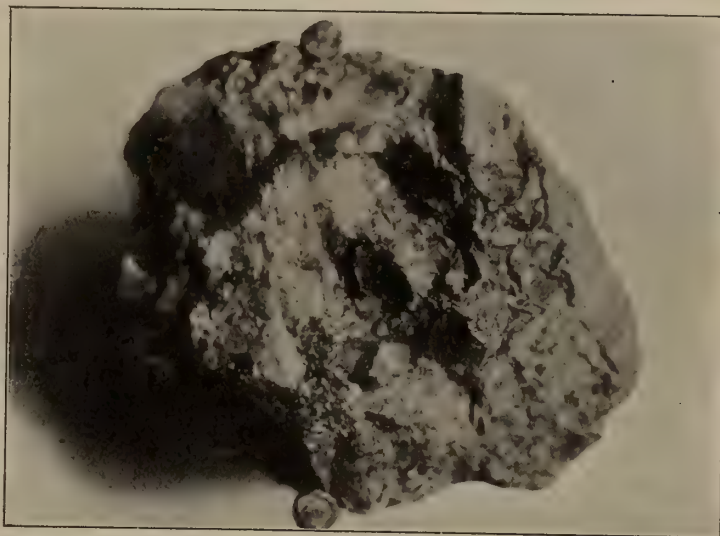


PLATE II.—Showing flakes of Molybdenite (M) in Pyroxene, etc.

assaying 50.4 per cent. Mo and comprising 32 per cent. of the molybdenite in the sample, the remainder escaping into the tails owing to the flaky nature of the ore. Retreatment of the middles from the Wilfley did not yield a clean product so that there will likely be a small loss in treating the oversize products from the screens by the Wilfley which for commercial purposes is probably the best method of cleaning up the oversize products. It is certain that the Hartz jig is not adapted to this purpose. With the object of checking off the results obtained in cleaning up the oversize products by the magnetic



separator a sample was sent to the Testing works of the Wetherill Separating Co., New Jersey, and the report as follows shows that this can be readily done although the manager was modest enough to report that the separation cannot be done on a practical basis owing to the high current required and the low capacity of the machine due to the necessary slow speed of the belt-conveyor. Personal observations would lead to writer to believe that the magnetic separator is as cheap and efficient as the Wilfley for cleaning up the oversize products provided a cheap means can be got for removing the embedded pyrrhotite from the larger flake of molybdenite. The smaller sizes of molybdenite do not show the grains of pyrrhotite fastened to the molybdenite so that only the larger sizes will need agitation in tumbling barrels. One advantage of the magnetic separation is that the oversize products do not need regrinding to finer size in a ball-mill as required in the Wilfley table separation.

#### MAGNETIC SEPARATION OF OVERSIZE PRODUCTS FROM SCREENS.

Separation was made at Testing work of Wetherill Separating Co., Newark, New Jersey, by George Ernst, assistant superintendent, and analyses by the writer.

*Character of ore.*—Oversize from screens consisting of molybdenite, pyrite, pyrrhotite, pyroxene, black mica, calcite, quartz.

*Object of the test.*—To secure molybdenite of commercial grade carrying at least 50 p.c. Mo.

*Separator used.*—Type E being the Rowand Cross belt machine as shown in plates 4 and 5 delivering magnetic heads, magnetic middles and non-magnetic tails.

*Sample A.*—Passing through 5 mesh screens to 10 mesh.

*Sample B.*— " 10 mesh.

| Product.                 | Nature.                            | Pole Dist. inch. | Amp. | Wt. of product. grams. | Size Treated. | Mo in product. | Grade | Extracted. |
|--------------------------|------------------------------------|------------------|------|------------------------|---------------|----------------|-------|------------|
|                          |                                    |                  |      |                        | p.c.          | p.c.           | p.c.  | p.c.       |
| A 1 Magnetic heads.....  | Mica, Pyroxene..                   | ½                | 4    | 7.5                    | 76.94         | 0.33           | ..... | .....      |
| A 2 Non-Mag. tails.....  | Molybdenite, Quartz, Pyrite. ....  | ½                | 4    | 2.0                    | 21.06         | 56.3           | 93.6  | 93.4       |
| B 1 Magnetic heads.....  | Pyroxene, Pyrrhotite.              | ½                | 2    | 3.0                    | 30.00         | 0.32           | ..... | .....      |
| B 2 Magnetic middles.... | Mica, Pyroxene..                   | ½                | 4    | 6.0                    | 60.00         | trace          | ....  | .....      |
| B 3 Non-Magnetic tails.. | Molybdenite, Calcite, Quartz ..... |                  |      | 1.0                    | 10.00         | 53.8           | 89.6  | 99.4       |

Sample B consisted of 40 lb. of ore from the Webber property in Victoria County, Ontario, already noted. Plate 2 shows a characteristic sample the flaky ore being in evidence. The sample carried quartz, calcite, pyroxene, mica, pyrite, hornblende and flakes of molybdenite of different sizes. Red oxid of iron and yellow oxid of molybdenum were found on the surface exposed to weather. The ore crushed, rolled and sized gave the following product:—

1. Hand-picked molybdenite weighing 8 ounces and carrying 55.2 p.c. being 92 p.c. pure.
2. Oversize on 0.30" screen weighing 2 lb. and carrying 4.58 p.c. Mo equal to 7.6 p.c. molybdenite.
3. Oversize on 0.20" screen weighing 10 lb. carrying 2.70 p.c. Mo equal to 4.5 p.c. molybdenite.
4. Oversize on 0.10" screens weighing 2 lb. This sample was included with the fines the total weighing 25 lb. and carrying 1.78 p.c. Mo equal to 2.90 p.c. molybdenite.

Oversize 2 was recrushed and screened yielding 1.25 ounces of 90 p.c. ore on the screen.

Oversize 3 was recrushed yielding 5 ounces of molybdenite 91 p.c. pure. All the fines from retreatment of the oversizes along with the fines from first screening were ground in ball-mill finer than 0.05" and passed to a Wilfley table delivering 10 ounces of molybdenite with pyrite and a little mica being 75 p.c. pure by assay. The middles from the Wilfley assayed 1.60 p.c. Mo and the tails 0.44 p.c. Mo showing that a small quantity was lost.

Altogether 24.25 ounces of molybdenite of commercial grade were saved as a result of the above experiments being about 72 p.c. of the molybdenite in the original sample. No experiments were made with the magnetic separator or oil separation.

Sample C consisted of 20 lb. of quartz and red felspar with small flakes of molybdenite scattered through as shown in plate 3. The sample carried 1.5 p.c. Mo equal to 2.5 p.c. molybdenite.

The sample crushed, rolled and sized gave no clean ore on any of the screens so that the whole sample was ground to pass 0.05" screen. A portion was treated in a Vezin hand jig as it was thought that as the



PLATE III.—Showing fine flakes of Molybdenite (M) in quartz.

specific gravity of molybdenite being 4.6 while that of felspar is 2.7 a clean separation would be possible in the jig but the flakes of ore seemed to be caught by upward pulsations of water so that no separation was possible.

12 lb. of the sample treated on the Wilfley table gave 1 lb. of concentrated ore carrying 6.84 p.c. Mo equal to 11.4 p.c. molybdenite, being a saving of only 38 p.c. of the value in the ore. This was due to loss as float in the tails as the fine particles of molybdenite seemed to be caught by a slight current of water and carried into the tails.

The molybdenite in the concentrates was readily removed by oil-separation as the selective action was very noticeable.

No constituents of this sample could be separated out by magnetic separation.

Sample D from the deposit in Harcourt Township, Ontario, already noted was examined but resembled sample A so closely that no attempts were made to concentrate it as in all probability it would act the same as A. The small experimental work on these ores have shown that no standard method can be used on molybdenite ores. Each ore is a problem by itself, only to be solved by experimental mill tests.

#### METHOD OF ESTIMATING MOLYBDENUM IN ITS ORES.

Several methods of estimating molybdenum in alloys and ores have been published and the writer made comparative tests on the different methods the results of which are irrelevant in this paper but will be submitted to chemical journals for publication. The writer devised the following rapid volumetric method for estimating molybdenum in



its ores being a modification of the estimation of phosphorus in iron ores by titration with potassium permanganate:—

Mix 0.20 to 1 gram of the ore according to richness with 6 times its weight of sodium peroxid and fuse in a nickel crucible for 10 minutes using a bunsen burner. Caustic potash may be added if the ore is very siliceous. Platinum crucibles must not be used as the peroxid attacks platinum also nickel but the latter is cheap.

The melt dissolves quickly in water acidulated with sulphuric acid, ammonia is added and the solution boiled to precipitate the ferric oxid, etc., Filter, add chemically pure zinc free from iron and sulphuric acid to reduce the molybdic acid to a lower form the clear solution turning an olive brown on reduction, but the reduction should be continued for 10 minutes after the olive-brown color shows in order to be sure that all the molybdic acid is reduced. Filter off excess of zinc with glass wool being careful to allow no particles of zinc to go into the solution. Titrate the olive brown solution to colorless and permanent pink using potassium permanganate standardized for iron or phosphorus. Subtract the amount of permanganate required to make a blank solution a permanent pink. The ratio of molybdic acid to iron is 0.8816 according to Blair's Chemical Analysis of Iron, page 62 and molybdic acid carries 66 p.c. Mo so that Fe value multiplied by 0.666 gives the Mo in the ore when 1 gram is used for analysis.

Van Furman states in his book on Practical Assaying page 102 that the ratio of molybdic acid to iron is 0.9076 but the writer chooses to follow Blair's figures.

All compounds reduced by zinc and sulphuric acid to a lower state must be removed. Among these are iron, titanium, vanadium, uranium, tungsten, chromium. The nickel taken up from the crucible apparently has no influence on the reactions according to blank determinations made by the writer. Qualitative tests were made on the Canadian samples of molybdenite tested showing that iron was the only interfering constituent present in more than traces.

This method was checked off by the electrolytic method which is certainly the most accurate but very slow and concordant results were obtained in nearly every case, although the volumetric method gives low results unless carefully done.

All the estimations of molybdenum given were done by this method which is recommended as a very rapid and quite accurate method.

#### INDUSTRIAL USES OF MOLYBDENITE AND ITS PRODUCTS.

The mineral molybdenite is the source of the metal molybdenum and the various chemicals used in the arts.

Metallic molybdenum free from sulphur may be made from molybdenite by heating in an electric furnace according to experiments conducted by M. Guichard reported in Comptes Rendues.

The molybdenite used carried—

|                     |                    |
|---------------------|--------------------|
| Mo.....60 per cent. | S.....39 per cent. |
| Fe.....0.75 "       | Si.....0.40 "      |

Heated in an electric furnace in carbon tubes with a current of 350 amperes and 50 volts, the sulphur was partially eliminated. With 950 amperes and 55 volts complete fusion was obtained and the sulphur completely driven off. The resulting metal analysed—

|                       |                      |
|-----------------------|----------------------|
| Mo.....91.5 per cent. | Fe.....2.1 per cent. |
|-----------------------|----------------------|

total carbon—6.9 about  $\frac{1}{4}$  of the carbon graphitic. A method of making molybdenum electrolytically is described by H. Moissan in *Bulletin de la Societe l'encouragement de l'Industrie Nationale*, June, 1895.

300 parts of molybdic oxid heated with 30 part of carbon in a carbon crucible by an electric current of 800 amperes at 60 volts for 6 minutes, produced the metal free from carbon carrying by analysis—

|                      |                        |                      |
|----------------------|------------------------|----------------------|
| Mo...99.98 per cent. | Carbon .0.00 per cent. | Slag..0.18 per cent. |
|----------------------|------------------------|----------------------|

Complete fusion of the charge should be avoided to prevent the fused mass attacking the crucible. The metal thus obtained is soft not

scratching glass, is easily filed and polished, malleable when hot. It oxidizes at 600° C volatilizing as molybdic oxid even before melting.

Combustion with oxygen produced vivid incandescence. When the reduction of molybdic oxid is made in the electric furnace with an excess of carbon, carbides of molybdenum are formed, the point of saturation being 5.87 p.c. carbon corresponding to the formula  $\text{Mo}_2\text{C}$ . When saturated with carbon the metal is intensely hard and more fusible than the pure metal.

Pure metallic molybdenum is silvery white in color, has a density of 9.01, is malleable like iron and is readily forged when hot. The pure metal is somewhat infusible, can be filed and will not scratch glass but if heated for some time in contact with carbon at about 1500° C cementation takes place and the metal is very hard after cooling. After the process of cementation it may be hardened by quenching like steel. A definite carbide,  $\text{Mo}_2\text{C}$  is known having a specific gravity 8.9 very hard and rather infusible.

The metal, molybdenum, is now being used to make molybdenum steel which is said to be replacing tungsten and chrome-tungsten steels. Tests made by Prof. W. Von Lipin of St. Petersburg and reported in *Stahl und Eisen*, 1897, No. 14, showed that the molybdenum steel in a general way but is less effected by tempering and annealing. High heating makes it very hard while annealing makes it softer than

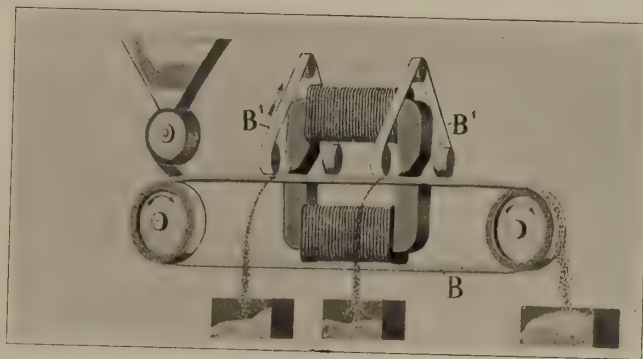


PLATE IV.—Reprint of a diagram of the Wetherill Magnetic Separator by F. O. Schnelle, published in a paper read before the Association for the Advancement of Industry (German). This machine separates mica, hornblende and pyrrhotite as magnetic products from molybdenite.

the tungsten steels. It can stand heating also tempering in water better than tungsten steel showing no fissures which tungsten steel often shows. It does not break could short as easily as tungsten steel and stands a forging and hardening better.

Experimental work has been done since that date by steel makers but little information is published. It is a well known fact however that tool steel carrying about 4 p.c. Mo is very tough and has the valuable quality of being self-hardening. It is used in shops where machine tools are pushed to their utmost capacity as self-hardening tool steel holds an edge at speeds which would draw the temper all out of carbon steel. Molybdenum steel according to trade reports is now being used to make all kinds of cutters as it can be machined to any shape.

Reports state that the excellent grade of armor plates made by the Krupp Works in Germany carries molybdenum along with tungsten and other rare metals. An excellent grade of steel for armor plates is said to have been made at the Creusot Works in France by using 3 p.c. Mo along with an equal amount of Chromium.

A discussion as to value of molybdenum in steel-making is irrelevant in this paper but for the convenience of those wishing to follow up the subject a list of technical articles dealing with special steels is included in the review of literature.

Molybdenum is sold both as the metal, as ferro-molybdenum alloy for use in steel-making.



The best molybdenum is quoted at \$1.82 per pound for 96 p.c. pure grade, Ferro-molybdenum (50 p.c. Mo) is quoted at \$1.25 per pound.

There are no metallurgical works in Canada producing the alloys nor is the ore mined or shipped except in very small lots but if the demand for the ore continues no doubt some of the richer deposits will be worked. According to official statistics 32,000 lb. of ferro-molybdenum carrying 50 p.c. Mo was produced in the United States during 1900.

About 15 tons of molybdenite were mined in the United States during 1901, but the output for 1902 is likely to be increased.

Molybdenite to be of commercial value must carry at least 50 p.c. Mo and be free from copper. Such ore sells for about \$400 per ton but as the market is somewhat limited over production would lower the price. The future of the industry of mining molybdenite depends on the new uses of the metal as the chemical industries absorb only a small quantity made up mostly into chemical reagents and dye chemicals although the use of aniline dyes has largely replaced its use in the dyeing industry. A small quantity is used in pottery works for making brilliant blue colors in the glaze.

#### REVIEW OF LITERATURE REGARDING MOLYBDENITE AND ITS COMMERCIAL PRODUCTS.

1. *Stahl & Eisen*, vol. 22, pages 579-589.—Discusses the making of tool steel for rapid lathe work. A full discussion as to tool steel especially self-hardening and their use in lathe work is given in the same journal, vol. 22, pages 454-456.
2. *Echo des Mines*, vol. 29, page 1197.—Gives a review of the use of ferro-molybdenum as made by electro-metallurgical processes.
3. *Journal of Franklin Institute*, vol. 153, pages 161-178.—Describes the process of making tool steel by Taylor-White method used at Bethlehem steel works.
4. *Baumaterialienkunde*, vol. 6, pages 227-229.—A criticism of the Taylor-White tool steel.
5. *Mining Journal*, vol. 72, pages 657-658.—Shows how the metals such as molybdenum are being used in the steel trade.
6. *Zeitschrift des Vereines Deutscher Ingenieure*, vol. 45, pages 1609-1610 also pages 1377-1386.—A full description of quick cutting tool steels.
7. *British Patent*, No. 738 of 1900.—Gives the composition of the Taylor White tool steel showing that it may carry from 1 p.c. to 5 p.c. Mo.
8. *Verhandlungen des Vereines Zur Berforderung des Gewerb-fleisses*, 1900, pages 179-189.—Describes the Taylor-White tool steel, and its practical value.
9. *Stahl & Eisen*, vol. 21, pages 169-176 and 215-220.—A discussion of tool steels.

The literature as to occurrence of the ores in Canada are already mentioned. There is practically no literature as to the concentration of molybdenite ores.

## PAYNE CONSOLIDATED.

The following is excerpted from Manager Garde's report to the directors at recent meeting of shareholders.

With the encouraging prospects of finding ore in lower levels it would be extremely desirable to consider the question of exploring the mine below tunnel No. 8. One commendable plan would be to continue tunnel No. 8 for about 300 feet towards west, until directly under the crest of Payne Mountain, and at this point to sink a central shaft, approximately 350 feet deep, from where three new levels Nos. 9, 10 and 11 could be driven, as indicated on map in dotted lines. The results would undoubtedly be the opening of new ore reserves within two years, at which time the present ore reserves probably would be exhausted. To accomplish this it would be necessary to install an electric hoist over the shaft, together with an adequate pumping plant, also driven by electric power. If this plan was adopted it would be necessary to increase the present power plant by installing a sub-power-station at Carpenter Creek, where the Company now holds water rights to the extent of 500 miners inches. A plant of this kind could be

conveniently operated in conjunction with the present power plant and pole line to the mine, as this feature was taken into consideration last year, when installing the present plant.

#### ORE IN SIGHT, STOPE FILLINGS, DUMPS, ETC.

From last year's report it will be observed that the estimated total tonnage of back fillings contained in old stopes at the mine, together with all dumps, etc., amounted to approximately 100,000 tons, which may be accepted as a correct figure. Of this tonnage one third, or 33,000 tons, has been successfully concentrated in the mill during the past year, thereby leaving a reserve of 67,000 tons on hand. With the increased concentrating capacity, this can all be milled within the next twelve months, and will at the same ratio of concentration produce about 2,000 tons of high grade silver-lead concentrates, and 4,000 tons of 60% zinc-blende. To this reserve can be added the estimated quantity of concentrating ore found in other parts of mine amounting to about 20,000 tons, which on account of being of a higher grade than the fillings will require about six months to concentrate.

From the above it will be seen that a total reserve of 87,000 tons of concentrating material is available, also that under favorable conditions this can be concentrated during eighteen months of continuous operation. It is, however, more likely to cover a period of two years, especially if there should be more material on hand in old stopes and dumps than estimated.

#### RECAPITULATION OF ORE RESERVES.

During the past two months the London lead market has advanced approximately 25% over quotations over the balance of the year, and you are now getting \$60.00 per ton, net smelter returns, for silver lead concentrates, with present prices of silver 49 cts. per oz., and lead \$2.00 per cwt. (smelter settlement.) This valuation is, therefore, figured in the following estimate of total ore reserves. Improvements in the concentrator and the benefits that will be derived from the new Magnetic Zinc Separating Plant has also been considered in the same estimate. Furthermore it would seem that the Dominion Government necessarily will have to decide on placing an adequate import duty on lead for the protection of the Canadian lead industry. The Government can hardly disregard the united petitions from a section of the Dominion that under favorable conditions is able to add more than any other part of Canada, to its general wealth.

In the United States the lead producer is now receiving \$3.90 per cwt. against \$2.00 (or less) in Canada. With your 60% lead ore, equal to 1,200 lbs. of lead, this price brings \$24.00 per ton, less 10% loss in smelting or a total of \$21.60. From this amount a \$15.00 freight and smelting charge, besides all cost of mining and general expenses, has to be deducted. It will therefore readily be seen that there would be little or no profits in lead mining, were it not for the high values of silver in the ores.

#### CONCENTRATOR REPORT.

It is with considerable gratification that I am able to state to you that the concentrating plant completed on the 1st of May, 1902, has been an unqualified success from the start, even with the extremely low prices that have governed the metal markets during the entire year.

Referring to my special report and estimate on concentrator plant, of November 3rd, 1901, submitted for your approval prior to erection, you will find by comparison with the actual work performed:—

1st. That the ratio of concentrating fillings has been 32 tons into 1, which is better than estimated, and that the tonnage of concentrates produced has consequently been increased in the same proportion.

2nd. The estimated mill capacity of 125 tons per twenty-four hours, has been exceeded by 35 tons.

3rd. In regard to the value of concentrates. These were based on silver at 57½ cents per ounce, but during the year this price depreciated to 49 cents, nevertheless the smelter returns show the average price received from smelter returns to be \$49.11 or equal to the estimated price, which is due to the higher grade of concentrates produced in the mill. In place of averaging 94.8-100 ozs. of silver and 54% lead to the ton, the average has been 103.8 ozs. of silver, and 60% in lead, thus making up for the lower metal quotations. The net earnings of concentrator were \$35,706.06, plus \$3,000.00 for value of zinc on hand, equal to \$38,706.06. If prices had remained staple in place of going down, \$58.21 or \$9.10 more would have been received per ton of concentrates, and the net profits increased by \$11,365.00 equal to a net total earning of \$50,000.00.

4th. In regard to the zinc-blende by product, it will be observed that 1,391 tons have been produced in the mill during the year, representing \$11,329.87. This amount compensates in a measure for the lower prices of metals.



5th. Regarding the tonnage and class of material put through the concentrator, approximately one-third was taken from the dumps, and two-thirds from old and new stopes. The net tonnage of silver-lead concentrates produced was 1,247. The gross tonnage put through the mill was 40,028 tons.

The estimated tonnage in reserve is approximately 87,000 tons, thus the concentrator will have a supply on hand for not less than 18 months and more probably two years.

One difficulty experienced in operating was a shortage of water during two months of the dry season, which held the capacity and efficiency of the mill back to some extent, and for a short time the mill could only be run on one shift. This feature will be overcome before the dry season sets in this year. Fifty miners inches water have recently been granted us, made up partly from an adjacent stream, and partly from mine water running out of tunnel No. 8. The intention is, at an expense of about \$2,000.00 to flume the water from the north side of the mountain to south side, thereby making it available for power and wash water purposes. With this increase of water I do not anticipate any difficulties in keeping the mill up to its full capacity all year round, especially as the past year proved one of the driest on record in the Slocan.

The plant was put in during the "hard times" when the prices of metals went lower than ever, and if it could prove a success under such adverse conditions there seems hardly any doubt that previous records can be surpassed, providing prices come up again, as the tendency appears now.

#### MAGNETIC ZINC SEPARATING PLANT—(NOW UNDER CONSTRUCTION).

Until recently all zinc ores in the Slocan, whether associated with galena or found otherwise, had been entirely disregarded and neglected as a mineral of any value.

In the upper ore-zones only a small quantity of zinc-blende is generally associated with the Galena, on which the smelters in the earlier days, placed no penalties. Different conditions existed in a number of the mines located at lower altitudes, where the Galena was highly disseminated with a zinc-blende that carried good silver values, but nevertheless could not be sold to advantage and was therefore avoided.

An attempt was made a few years ago to ship 1,500 tons of zinc to Swansea, England, but stranded on account of the sudden death of the promotor. After this unsuccessful effort the zinc ores were left on the dumps, or went through the tailraces as so much waste.

In the meantime the percentage of zinc kept increasing in the Galena in nearly all the mines, and necessitated the smelters placing a 10% limit on zinc, with a penalty of 50 cts. per unit above same. In a number of instances the penalty was severely felt, as only a few mines were in a position to keep within the limit, and a number of properties with 25 and 30% zinc in the Galena could not, for this reason, be operated to advantage.

During 1902 the zinc limit was changed from 10% to 8% and it became evident, more so than ever, that something had to be done to overcome the continually increasing penalties. Encouragement was therefore offered by myself and some of my confreres, which soon resulted in making satisfactory progress towards solving the zinc question, at least as far as your properties are concerned.

While constructing your concentrator in the fall of 1901, provisions were made to save zinc values, and an accumulation of several hundred tons of 43 to 45% zinc concentrates were made between June, 1902 and January, 1903, with the hopes of securing a market. This lot has now been disposed of in Kansas, and netted over \$8300.00. You will readily appreciate that this first attempt in the zinc business was fairly good for a starter, when remembered that the zinc was produced as a mere by-product.

In the meantime I found by careful experiments and tests that a far higher grade of zinc-blende can be made by giving the ores a slight roast, whereby the (Spathic) iron is partly converted into an oxide of iron, in which form it becomes an artificial magnetite, and can be eliminated from the blende in magnetic separating machines with fields of intensified magnetic force.

As soon as this important feature has been fully demonstrated, my proposition to erect a plant for treating 40 tons of zinc ores per 24 hours in this manner was presented to you, and upon receipt of your prompt decision ground was broken on the 1st of February, and the necessary machinery ordered at once.

The above plant is expected to be completed in June, providing all the machinery can be obtained within the stipulated time. The machinery

comprising roasting furnace, magnetic separators, screens, elevators, fine rolls, etc., will be placed in a building 40 feet wide by 60 feet long. This building is a west end extension of the present concentrator.

The finished product which will run approximately 60% in zinc, and 16 to 20 ozs. in silver, will contain only a small percentage of iron, and less than 2% in lead.

With the prospects of being able to produce 6,000 tons or more of zinc from present ore reserves in the mine, during the next eighteen or twenty-four months, I am able to predict a bright future for zinc, and it will be readily seen that the revenues from this by-product from now on will be an important factor to contend with.

#### REVIEW OF PAST YEAR.

In regard to the future of the Payne Mine I shall forbear from making promises that necessarily will have to depend on future developments, as well as fair prices for silver, lead and spelter. At the same time I beg to call your attention to certain features that compare favorably with conditions three years ago. At that time tunnel No. 5 had little or no ore exposed in the floor, while to-day the main vein with pay-ore has been proved to a depth of 360 feet below No. 5, and 900 feet below the apex.

I have stated in my last year's report, and I desire to repeat that the true fissure nature of the Payne vein with its banded arrangement of minerals, is both characteristic and favorable for deeper prospecting. Lean strata such as found in all mines, and of which No. 5 tunnel is an example, must be expected, also a hard formation, which will have to be counteracted by the exclusive use of power drills. Subterranean water, will, no doubt, make its appearance further down, but can be overcome.

Zinc-blende is now disseminated with the galena to a far greater extent than heretofore, and one of the most important features of the past year has, therefore, been the happy solution of concentration and separation of zinc-blende from the galena, whereby a valuable by-product is added. I have mentioned elsewhere that the constantly increasing percentage of zinc seriously threatened to increase penalties imposed by the smelters, but with the present system of milling it will readily be seen that this feature has been entirely overcome. All ores of a complex nature can now be concentrated into a silver-lead product of an even higher grade than the former clean shipping ore, while the zinc-blende is yielding a by-product of high commercial value. By having the present complete and successful concentrating plant installed and paid for, together with the Magnetic Zinc Separating Plant, now under construction, you will be in an excellent position to handle all concentrating ore bodies that in depth may possibly replace the former lenses of clean galena, and inasmuch as the zinc-blende must necessarily be separated from the galena when the 10% zinc limit is reached, the feature of concentration, not alone overcome smelter penalties, but improves the silver-lead product, and adds the zinc-blende as a valuable by-product.

I can furthermore assure you that the extra cost of concentration—including a legitimate loss of values in milling—is readily offset by the lesser cost of mining, and expensive hand-sorting in the stopes.

All concentrating ore will hereafter be extracted from wall to wall, regardless of high or low values, and no material that pays to concentrate will be permitted to remain in the mine or go to the dumps. Hand-sorting of clean ore will not be done in the mine as heretofore, but in broad day light at the concentrator, before entering the mill. This constitutes a part of the crusherman's duties. Prior to sorting, all fine material is screened out through a special trommel while large pieces of ore and waste are sorted out by the crusher-tender, thereby accomplishing a material saving. I am quite convinced that the ensuing year, by the above method of mining and concentrating, together with the introduction of additional machine drills will show a material reduction of all operating expenses.

## CROW'S NEST PASS COAL.

The following is excerpted from the proceedings of the recent annual meeting of shareholders:—

"The coal produced during the year 1902 amounted to 442,049 tons, as compared with 425,457 tons in 1901. Of this tonnage 191,605 tons were sent to the Company's ovens, and produced 121,000 tons of coke, as against 125,085 tons made in 1901, while the balance, 250,444 tons were disposed of as merchantable coal.

During the year the Company's pay rolls amounted to \$1,111,068.18, as against \$911,407.15 in 1901, while the additions to plant and the development work at Coal Creek, Fernie, Michel and Morrissey amounted to the



large sum of \$1,030,180.58, of which machinery and supplies came to \$729,617.76.

The Company's four mines at Morrissey yielding 700 tons a day were all opened up during 1902. To make it possible to take from these entries large quantities of coal involves the installation of much machinery, and the doing of large permanent development work which cannot be accomplished quickly. There is necessarily a large expenditure of time as well as money. The same remarks apply to the new mines at Michel and Coal Creek, now in good coal, and besides these there has been a good deal of re-arrangement necessary to the workings of some of the older mines.

But this great amount of permanent development work done during the year, and the increased facilities provided by the new plant installed, entitle the directors to rely on a material increase in the output, which is now steadily increasing, and a larger output means a wider margin of profit.

The number of men actively employed in the Company's works at the end of the year was 2,039, as against 1,312 on the same date 1901.

The amount paid in royalty and tax on coal to the British Columbia Government for the year is \$22,350.10, and tax on coke \$9,719.37, or together \$32,069.47.

The demand for coke has increased during the year to the full capacity of the existing ovens, but it is expected the additional ovens being built will quite meet the requirements, not only of the Canadian but American smelters. To meet the expected demand for coke, five hundred new ovens are in course of construction, the larger number being built at Morrissey, at which place up to the present time there have been none.

During the year the Crow's Nest Southern Railway Company has constructed a line from Midway on the International boundary line, where it connects with a line of railway from Jennings, Montana, on the main line of the Great Northern Railway to Morrissey Junction, and a branch has been built up to the Company's mines at Morrissey. This gives to the Company direct communication with U.S. points, at which it is expected to market in the future a considerable proportion of the increased output.

By reference to the Profit and Loss Account, it will be observed that the sum of \$517,017.41 was brought forward from the year 1901. This amount was made up from two sources: (1st) A premium of 60 per cent., or \$300,000 paid in during the year 1901 as premium on \$500,000 new stock, issued and taken up by the shareholders, and (2nd) from surplus earnings of the Company not disbursed to the shareholders, \$217,017.41.

The net profits as a result of the year's operations amount to \$171,285.80, and as the disbursements during the year for dividends amounted to \$250,000.00, it was necessary to draw upon the previous surplus earnings of the Company above mentioned to the extent of \$78,714.20."

The director's feel that this result is really a most satisfactory one, having regard to the fact that the Company's chief producing mines were closed down from the 22nd of May to the end of the year, involving a net loss of 1,000 tons of coal a day, and to the protracted strikes which stopped all production for considerable periods of time.

On the 22nd of May during the second working shift a serious explosion occurred, involving the greater portion of Nos. 2 and 3 mines at Coal Creek, killing instantly 130 of the Company's employees. An inquest was held, but after fourteen days of patient attention to the evidence adduced, the jury were not able to fix the initial point of the explosion. The Government of British Columbia appointed the Provincial Mineralogist and two mine managers from Vancouver Island to examine into and report upon the explosion. These gentlemen made a thorough investigation of the mines, and agree that the catastrophe was brought about by an initial explosion of gas at the working face of McDonald's level in the extreme deeps of No. 2 mine, the gas coming from a "blower" or "feeder" which had been uncovered shortly before the explosion, and from which gas was oozing in considerable quantities more than a week after. How impossible it is to tell what lighted up the explosive mixture of gas and air can be gathered from the official report of Provincial Mineralogist Robertson, of B.C., who says: 'The initial cause will probably always remain a mystery, and is at best only a matter for speculation, although it is almost certain to have been a naked light of some sort which set fire to the gas.'

Your Board paid all funeral expenses and relieved against immediate suffering, and felt disposed to deal generously with the bereaved families; but immediately after the inquest, 120 notices of action were served on the Company by the relatives of deceased miners, and 32 writs issued, so that the Company has found it impossible to carry out its intentions as above expressed. None of the actions have as yet been brought to trial. An order

has been made by the Court for the trial of a test case, which is to govern in the 32 actions already commenced.

In this connection I would call your attention to the fact that on the 19th and 20th of May, Archibald Dick, Government inspector of Mines, examined the mines in question and reported "everything in good order."

Under the Coal Mines Regulation Act of B.C., a committee of miners have the right to inspect the mines in the interest of the employees, and report in writing over their own signatures. On the 8th of May a committee of the Miners' Union appointed to inspect No. 2 and No. 3 mines, after going over the whole of the area involved in the explosion, gave the following certificate: "We, the undersigned, appointed by the Gladstone Miners' Union No. 76, of Fernie, B.C., visited No. 2 and No. 3 mines, as set apart by the Act, and found them all clear of gases and in good condition, with the exception of want of timber in section No. 2 mine. Signed, Thos. Addison, Thos. Stevens."

Between the 25th of June and the 4th of August the miners at Coal Creek were on strike, and later on the miners at Michel, and still later the miners at Morrissey went on strike; but in all cases the matters in dispute were adjusted satisfactorily to all parties, and the men resumed their occupation.

On the 11th day of February, 1903, all the men inside and outside at all the Company's mines, having formed a new union, ceased to work, but have never notified the Company they have struck, or waited upon the Company with any demands, or given any reasons for their actions. The Minister of Labor sent his Deputy to Fernie to try and arrange matters, but he was unsuccessful. The Provincial Mining Association of British Columbia have appointed a committee of six to endeavor to adjust matters, which committee is expected to reach Fernie to-day. In this connection it is well to point out that the miners in the Company's employ are the best paid miners in the world, their average earnings for the last five months amounting to \$4.71 per day of eight hours, divided as follows:—

|                              |                |
|------------------------------|----------------|
| At Morrissey, all mines..... | \$4.64 per day |
| At Michel ".....             | 4.87 "         |
| At Coal Creek ".....         | 4.63 "         |

The 50,000 acres of coal lands to be conveyed under the Statute of 1897 to the Dominion Government were selected by the Government in May last, and the conveyance provided for.

The Directors have thought it wise to open a town site in the neighborhood of the Company's mines at Morrissey, and a plan having been prepared for this purpose, offerings will be made to the public as soon as spring arrives.

The differences between the Company and the Government of British Columbia with regard to the Company's town site at Fernie were amicably adjusted by the means of legislation obtained at the last session of the Legislature of British Columbia.

It has been thought advisable to dispose of the Company's stores, the possession of which by the Company has been made a matter of continuous unfavorable comment, although quite unfairly. The stores do come into competition with the trading public, and this source of irritation will, by the sale, be removed.

## DOMINION STEEL.

The following report was submitted to the shareholders at the annual meeting held at Montreal on the 14th instant:—

By the terms of the lease entered into between this Company and the Dominion Coal Company, Limited, which was duly ratified and approved by the shareholders of the two Companies, the Dominion Iron and Steel Company, Limited, has leased the entire property of the Dominion Coal Company, having entered into possession thereof as at 1st March, 1902.

The fiscal year of the Dominion Coal Company formerly closed on 28th February, and that of the Dominion Iron and Steel Company on the 30th April in each year, but it was considered advisable by the Directors of the two Companies in order to simplify the keeping of accounts that the fiscal year of both Companies should be concurrent, and the by-laws of the Companies were accordingly amended to the effect that the fiscal year of both Companies should terminate on the 31st December in each year.

The report which your Directors have therefore to present embraces only eight months' operations of the Steel Department and ten months' operations of the Coal Department (the leased property).



The Directors would point out that while there is a surplus on the Company's operations for these periods, after paying dividend on preferred stock of \$309,612.88, there have been expenditures on capital account amounting to \$1,730,887.43, which expenditures in the case of the Steel Department were following out the general plan for the completion of the plant, and in the case of the Coal Department were chiefly for development work at the mines and for shipping facilities all of which have greatly enhanced the earning capacity of the Company's properties.

#### STEEL DEPARTMENT.

The output of pig iron for the eight months was \$148,399 tons or an average of 18,550 tons per month. The output of steel billets was 81,513 tons, or an average of 10,189 tons per month. The result of the operation of the Company so far is to prove that its plant is able to produce pig iron and steel, which meets the most exacting requirements of its customers. These include nearly all the important manufacturing plants in Canada and some of the largest locomotive works and plate mills in the United States.

#### COAL DEPARTMENT.

The sales for the ten months amounted to 2,836,321 tons, an average of 283,632 tons per month as compared with 2,276,270 tons for the corresponding ten months of the previous year, an average of 227,627 tons. Development work has been fully carried out and the prospects for the present year are excellent.

Notwithstanding the unfortunate fire at Dominion No. 1 Colliery in March last, now it is believed extinct, the output from January 1st to May 1st in the current year is 966,097 tons as compared with 881,714 tons in the same months of 1902.

#### Financial Statement ending December 31st, 1902.

|                                    |                |
|------------------------------------|----------------|
| Earnings Coal Department 10 months | \$1,977,328 10 |
| Less 10 months rent                | 1,333,333 33   |

|                                     |              |
|-------------------------------------|--------------|
| Net                                 | \$643,994 77 |
| Earnings Steel Department 8 months' | 309,886 90   |

|       |              |
|-------|--------------|
| Total | \$953,881 67 |
|-------|--------------|

|                            |              |
|----------------------------|--------------|
| Less—                      |              |
| Bond Interest 8 months'    | \$265,376 94 |
| General Interest 8 months' | 112,225 17   |
| Sinking Fund 8 months'     | 33,333 34    |

|                        |              |
|------------------------|--------------|
|                        | 410,935 45   |
| Net Operating Earnings | \$542,946 22 |

|                                     |            |
|-------------------------------------|------------|
| Less—                               |            |
| Preferred Stock Dividend, 8 months' | 233,333 34 |

|         |              |
|---------|--------------|
| Surplus | \$309,612 88 |
|---------|--------------|

#### ASSETS.

|                                                   |                 |
|---------------------------------------------------|-----------------|
| Property                                          | \$33,465,257 17 |
| Cash and Accounts receivable                      | 2,491,675 23    |
| Raw and Manufactured Material on hand             | 2,229,072 82    |
| Insurance Taxes, S. S. Hire, &c., paid in advance | 52,896 01       |
| Coal Rental, 2 mo. paid in advance                | 266,666 67      |

#### LIABILITIES.

|                                              |                 |
|----------------------------------------------|-----------------|
| Bonds                                        | \$ 7,946,000 00 |
| Common Shares                                | 20,000,000 00   |
| Preferred Shares                             | 5,000,000 00    |
| Cape Breton Real Estate Debentures           | 360,880 00      |
| Dominion Rolling Stock Debentures            | 270,879 96      |
| Mortgages                                    | 72,000 00       |
| Notes and Accounts Payable                   | 4,274,733 26    |
| Interest, Dividends &c., accrued and not due | 204,469 85      |
| Contingent Fund                              | 66,991 95       |
| Profit and Loss                              | 309,612 88      |

\$38,505,567 90

#### CAPITAL EXPENDITURE.

|                                                                                                      |              |
|------------------------------------------------------------------------------------------------------|--------------|
| Expended for new construction Steel Department, for 8 months from May 1st, 1902 to January 1st, 1903 | \$864,626 46 |
|------------------------------------------------------------------------------------------------------|--------------|

|                                                                                                                     |  |
|---------------------------------------------------------------------------------------------------------------------|--|
| Expended for new construction Coal Department for 10 months from March 1st, 1902, to January 1st, 1903, as follows: |  |
|---------------------------------------------------------------------------------------------------------------------|--|

|               |              |
|---------------|--------------|
| At Collieries | \$631,714 74 |
| At Montreal   | 9,044 02     |
| At Quebec     | 502 21       |

|                                        |                |
|----------------------------------------|----------------|
| Other Capital Expenditures as follows: | \$1,505,887 43 |
|----------------------------------------|----------------|

|                                            |            |
|--------------------------------------------|------------|
| St. John Wharf Property                    | 100,000 00 |
| Sydney and Glace Bay Railway Capital Stock | 125,000 00 |

225,000 00

\$1,730,887 43

## DOMINION COAL.

The following report was submitted to the shareholders at the annual meeting held at Montreal on the 14th instant.

"By the terms of the lease entered into between this Company and the Dominion Iron and Steel Company, Limited, which was duly ratified and approved by the shareholders of both companies, the latter Company has leased the entire property of this Company for a rental of \$1,600,000, payable quarterly, having entered into possession thereof as at 1st March, 1902.

In order that the fiscal years of both companies should coincide, it has been deemed expedient to alter the date of the close of the fiscal year of this Company from 28th February to 31st December in each year; and accordingly the present report embraces a period of only ten months.

Dividends at the rate of eight per cent. per annum have been paid on the Common Stock of the Company commencing 1st April; dividends on the Preferred Stock and interest on the bonds of the Company and general expenses have also been paid, leaving a balance of \$64,859.88 to be carried forward.

#### Annual Statement for Ten Months ending December 31st, 1902.

##### ASSETS.

|                                                             |                 |
|-------------------------------------------------------------|-----------------|
| Property Account                                            | \$20,446,256 02 |
| Sinking Fund Investment (\$111,800 U.S. 4s. costing)        | 124,817 62      |
| Sinking Fund Cash (deposited with New England Trust Co.)    | 8,298 89        |
| Cash under Art. IV. (deposited with New England Trust Co.)  | 6,792 95        |
| Notes receivable (Dominion Iron and Steel Company, Limited) | 385,000 00      |
| Cash                                                        | 6,141 07        |

\$20,977,306 55

##### LIABILITIES.

|                                                                     |                 |
|---------------------------------------------------------------------|-----------------|
| Common Shares                                                       | \$15,000,000 00 |
| Preferred Shares                                                    | 3,000,000 00    |
| First Mortgage Bonds (\$4,500 drawn, not yet presented for payment) | 2,594,000 00    |
| Rent (January and February paid in advance)                         | 266,666 67      |
| Bond Interest (accrued September 1st to January 1st)                | 51,780 00       |
| Profit and Loss                                                     | 64,859 88       |

\$20,977,306 55

##### PROFIT AND LOSS.

|                                                        |                |
|--------------------------------------------------------|----------------|
| Ten Months' Rental                                     | \$1,333,333 33 |
| Interest                                               | 28,007 78      |
| Less—                                                  |                |
| Preferred Stock Dividend 10 months'                    | \$ 200,000 00  |
| Common Stock Dividend 9 months'                        | 900,000 00     |
| Bond Interest 10 months' and Premium on bonds redeemed | 143,996 55     |
| General Expense 10 months'                             | 52,484 68      |

\$1,296,481 23

|                             |            |
|-----------------------------|------------|
| Balance                     | 64,859 88  |
| Sinking Fund for 10 months' | 130,824 50 |

#### The Frank Disaster.

(By W. BLAKEMORE, Fernie, B.C.)

One of the most terrible and unique disasters which has ever overtaken a little town occurred at Frank on the 30th ult., furnishing a result which cannot be adequately described in words and must be seen to be believed. With the picturesque and sensational aspects I have nothing to do. There is however a side of the case which is of great public interest and especial interest to your readers and with that I purpose to deal.

A word may be said as to the area affected and the terrific force generated by the mountain slide. The dislodged rock spread itself out fan shaped across an area of 1,000 feet and extended for a mile and a half to the north of the mountain. From east to west across the broadest part of the slide measures two miles, and I estimate that the average depth of rock spread over this whole district is 30 feet. Taking this calculation by the size of the cavity left on the mountain side, which is approximately 25,000 feet long, 2,000 feet high, 200 feet thick, it will be seen that upwards of 100,000,000 tons of rock have been dislodged. Estimating certain natural conditions, and taking a meanheight of the fall at 3,000 feet a careful mathematical calculation will show that the fall generated a force equal to one thousand million horse power generated continually for two months. I make this calculation simply to show that the force is one which the imagination



fails to grasp and which sufficiently explains how it was possible for the whole mass of rock to be transferred nearly two miles on an elevation 500 feet higher than the base of the mountain. It also explains why the packing of the rock was so solid, this being due not only to the tremendous force generated, but to the resistance offered by the rapidly rising ground.

The special aspect to be solved, which is of importance to the mining world, is the consideration of the evidence afforded as to the cause of this truly terrific disaster. In order to arrive at this I made a careful examination of the scene after the disaster, and also had the advantage of a personal interview with some of the imprisoned miners, with experts who have been upon the ground since the occurrence, and with residents of the town, and I am able to form a fair statement of the cause. The first impression, as telegraphed on the morning of May 1st, attributed the calamity to a volcanic explosion or possibly to an earthquake. Probably from the inherent possibility of either theory the facts of evidence veto both suggestions. The former theory was abandoned within a few hours, there being not the slightest shred of evidence to support it, and it being absolutely an invention of the fertile brain of a penny-a-liner. The earthquake theory is attributed to the fact that the slide in its rush produced a concussion in the air and a loud report but this is sufficiently accounted for when the mountain is viewed in broad day light, and the fact that there were no rumblings or tremors and that not a pane of glass was broken in the town is sufficient evidence that this theory must be abandoned. When such a gigantic land slide occurs it demands absolute evidence, and if we find all the conditions necessary to account for the result produced, then to seek for any fantastic theory is to ignore the obvious for the obscure. I find an unanimity of opinion that the slide was induced, if not produced, by the mining operations of The Canadian American Coal Company, and for reasons, which to my mind appear quite clear, I have to endorse this opinion. We will first take evidences of the surface, which would seem to account for this cause, with its effects. The slide is adjacent to the workings of the mine. These workings were carried on in a seam of coal fourteen feet wide and practically vertical. The seam ran parallel with the mountain, N.W.S.E., and had crept along the lower half of the mountain at an elevation ranging from zero to 1,000 feet. The lower half of the mountain was covered to a depth varying from 20 to 50 feet, with debris. Behind and above this the mountain tower looms perpendicular. It will thus be seen that the coal seam formed a natural support or toe for the foot of the mountain and that the removing of it would have a similar effect to the cutting away of the lower edge of the mud slide or the partial under cutting of the face of coal. This process had been continued for a longitudinal distance of about three quarters of a mile and to a vertical height, above the main entrance, to approximately 500 feet. When the slide came away the upper part of the workings were carried with it and the imprisoned miners dug their way, through the fallen rock, at a point 150 feet from the entrance of the mine. Where originally the cover was more than 100 feet the length of the slide across measures exactly with the length of the workings from which the gravel has been extensively removed. Assuming that the removing of the natural barrier was the cause of the mountain giving way established the connection between the workings and the slide.

The next important evidence is that a series of crevices were discovered by the experts who ascended the mountain shortly after the slide. One

of these crevices is described as being more than one thousand feet long and fifteen feet wide at the top, and the depth so great as to be unmeasurable. A miner, none other in fact than a well known Nova Scotian, informed me that when hunting on the top of Turtle mountain last fall he found several crevices running length wise behind the present slide and that they were then wide enough to necessitate his jumping in order to cross them. Some of the imprisoned miners told me that for many months past they had heard rumblings in the mine and that these rumblings were not produced in the seam, but evidently farther back. They state further two very important facts, namely: that there was a "squeeze" throughout the mine which frequently buckled and burst the timber set in one night. The sets were from 20 inches to two feet square. The other most significant fact which they relate is that numerous flakes of rock had been forced from the wall next the mountain into the road. One piece which they measured several months ago was 80 feet by 15 feet wide and five feet thick. It is certain that such a rock burst as this could only have resulted from an incipient slide. If to these circumstances be added the statement of the same men that know the system of working adopted that there was a vertical man way from 300 to 400 feet, the pillar of either side of it 20 feet wide, and that between these points the whole of the coal was breasted out, it is easy to understand from these assumptions how conclusive the other evidences are as to what actually occurred. The whole thing may be summed up as follows: The removal of the natural support by the system of working which left a very small percentage of solid coal to protect the walls. The slight but gradual crumbling of the strata on the hanging wall of the mountain side evidenced by rumbling and the numerous breaking away of flakes of rock. Finally the production of numerous crevices at the back, with the continual diminishing of the support until either by a natural process of disintegration or as a result of some sudden shock in the mine, such as a blast, it moved away in a moment carrying death and destruction in its wake. As far as I am able to judge, any other explanation enforces improbabilities if not impossibilities.

Taking all the conditions into account I do not think it possible to work this coal safely by any system as the texture of the limestone in the mountain is such that the slightest interference with it would surely bring it down. The slide has left a very singular looking peak immediately behind the town, and at the back of this peak is a deep crevice. I assume the common opinion that this peak will fall. It will probably do so within a year or two in consequence of the rain and snow filling the crevices and after loosening the rock it will certainly do so if assisted by any artificial movements of the strata.

**POGSON, PELOUBET & CO.**

**PUBLIC ACCOUNTANTS**

|           |   |   |   |                    |
|-----------|---|---|---|--------------------|
| NEW YORK  | - | - | - | 20 Broad Street    |
| CHICAGO   | - | - | - | Marquette Building |
| ST. LOUIS | - | - | - | Chemical Building  |
| BUTTE     | - | - | - | Hennessy Building  |

# BRIQUETTING MACHINERY FOR SMELTERS AND BLAST FURNACES....

**BRIQUETTE your Flue Dust, Fine Ores, Calcines, Concentrates, Slimes and other Mineral Fines**

**INCREASES THE CAPACITY OF THE FURNACE FROM 10 TO 25 PER CENT.**

Our Improved **WHITE MINERAL PRESS** the only successful machine for the purpose.

Adopted by most all the Prominent Smelters in the United States.

Used by several Large Steel Works for briquetting Common Iron Flue Dust.

Sent on Trial and  
Satisfaction Guaranteed.

**CHISHOLM, BOYD & WHITE CO.**

CATALOGUE MAILED ON  
REQUEST

OFFICE AND WORKS: 5700 Wallace St.

CHICAGO, ILL., U. S. A.



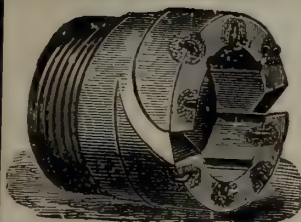
## COMPANY NOTES.

**Nova Scotia Collieries, Limited.**—The promoters are offering for subscription in London 100,000 6 per cent. debentures, and 100,000 ordinary shares. The preference shares will receive an additional dividend, after 10 per cent. has been paid on the ordinary, should the profits suffice. The area acquired by the company consists of 16,640 acres in the county of Inverness, Cape Breton, Nova Scotia, and it is estimated by the Government Inspector of Mines for that province to contain many million tons of coal. The company has already been offered a contract to supply 200 000 tons of coal per annum for a period of 10 years, on which an estimated surplus of £9,000 per annum is shown, after paying the interest on the preference shares and 10 per cent. on the ordinary. Of this issue, 50,000 preference shares have been underwritten for a commission of 5 per cent. cash and 15 per cent. in ordinary shares. The owner of the property receives £90,000 in shares or cash from the promoting syndicate, who receive £142,500, which they agree to take entirely in shares if required.

**London and British Columbia Gold Fields.**—The report of the London and British Columbia Goldfields, Ltd., to 31st December last, states that the very serious fall in the price of lead and silver during the period under review has had a disastrous effect on the company's large share holding in the Whitewater, Ruth, and Enterprise Companies, and the assessment on the shares of the Ymir Company through its reconstruction involved a heavy liability to preserve this interest. The effect of this, and the delay in completing the Kettle River Power Company's works makes it now necessary to provide additional capital to satisfy immediate liabilities and to enable the directors to preserve the company's valuable assets. The Ymir shares and Kettle River debenture stock and shares have great prospective value, and the preservation of these assets alone would make it particularly desirable that some financial arrangement for this purpose should immediately be carried out. In addition to these assets, however, the company's interests in the silver-lead properties belonging to the Whitewater, Ruth, and Enterprise Companies should be favourably affected by the recent and rapid appreciation in the price of silver, and also by the new legislation which, it

is hoped, will be enacted by the British Columbia Government for an improvement in the conditions affecting the markets for the sale of lead. In order to facilitate the dealing with the company's liabilities, the chairman who was in New York at the latter end of last year on personal business, visited Montreal and spent several days in conference with Mr. Fowler, with a view, amongst other things, of disposing of some of the Kettle River debentures, but, owing to the condition of markets in Canada and to the Crow's Nest coal strike and other causes, there has been no opportunity up to the present of doing this without undue sacrifice; but now that the Kettle River Company is actually supplying power to the towns mines, and smelters in the district, and is earning a revenue, the value of its debentures and shares is being rapidly enhanced. It is necessary, however, to at once provide funds for satisfying the company's immediate liabilities, to enable the directors to preserve the large number of shares which represent its principal assets, and after most careful consideration it has been decided to recommend that the company be reconstructed with a liability of 4s. per share, the payment of which will be spread over as long a period as possible. The directors, having subscribed largely to the last issue of shares, are themselves very large shareholders, and as such regret the necessity for the scheme now proposed, but they are prepared to provide their proportion of the assessment. Resolutions for giving effect to this proposal will be submitted at an extraordinary general meeting convened for the 18th inst.

**Intercolonial Coal and Coke Company.**—This company has been incorporated under Washington laws, with \$3,000,000 capital, par \$1. to acquire coal properties at Blairmore, district of Alberta, 45 miles east of Fernie, on the Crow's Nest Division of the Canadian Pacific Railway. The coal area is about seven miles in length, and there are nine veins on the property, four of which have been prospected. The aggregate width of these four seams is something over 60 ft. A. C. Flumerfelt is president, and H. N. Galer assistant general manager of the Granby Company, treasurer. The stock has all been subscribed for by Granby stockholders, so that while it is independent of the Granby Company, it will be closely allied with it. The construction of 100 coking oves will be commenced at once, and the output of the mines will be sold to independent smelters and railways, in addition to the Granby Company.



GOODS SENT SUBJECT TO APPROVAL

**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



**LAURIE ENGINE COMPANY**

MONTREAL - - CANADA

**IMPROVED**

**CORLISS**

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

**ENGINES**

FOR ELECTRIC LIGHT and POWER PLANTS.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

## 1903

THIRTEENTH  
YEAR

BY

### B. T. A. BELL

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE ASSN.

This standard work of reference to Canadian Mining undertaking and active industries is now printing and will be issued in July.

## A COMPLETE MINING DIRECTORY

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces

For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

A Complete  
Directory  
to all  
Canadian  
Collieries

Blast Furnaces

Mines

Quarries

Mills

Smelters

and

Mineral

Producers

Endorsed

by the

Canadian

Mining

Profession

Authentic

Information

Concerning

their

History

Organization

Capital

Dividends

Accounts

Operations

Statistics

Plants

Labour

Approved

by the

Mining

Financial

Press

Subscribe  
for it.

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

Advertise  
in it.



FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

F. E. LEUSHNER,

Room 12, Janes Bld., TORONTO, Canada.

**A. LESCHEN & SONS ROPE CO.**  
920-922 N. 1<sup>st</sup> STR. ST. LOUIS, MO.

BRANCH: 92 Centre St., NEW YORK, N. Y.  
OFFICES: 137 East Lake St., CHICAGO, ILL.  
85 Fremont St., SAN FRANCISCO, CAL.

WIRE ROPE &  
AERIAL WIRE ROPE  
TRAMWAYS



TRAM AT BESSIE MINE, TELLURIDE, COLO.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

4 TRAINS DAILY 4  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket  
agent of this company or connecting lines.

E. J. CHAMBERLIN,  
General Manager.

C. J. SMITH,  
Gen. Traffic Manager.

W. P. HINTON,  
Gen'l Passenger Agent.

J. E. WALSH,  
Ass. Gen. Passenger Agt.

## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

**60%** California-Nevada Mining Co.  
**PER ANNUM GUARANTEED**

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL  
MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT A 200-TON PER DAY PLANT  
READY FOR THE MILL, and the CONTRACTED FOR and will be  
Hoodlum Claim, which adjoins the in full operation not later than  
Old Victor Mine, yet to figure on. April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.

Do not fail to investigate this proposition, for the more you investigate the more  
stock you will want. Write for prospectus.

W. H. BALDWIN & CO., Brokers and Financial Agents 49-50-51-52 VOLCKERT  
BLDG., ALBANY, N. Y.  
REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company,  
Los Angeles, Cal.; any mining journal of the state or prominent mining men.



## Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical  
production of valuable minerals and metals, by means of meetings for the  
reading and discussion of technical papers, and the subsequent distribution  
of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters  
for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining  
and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and  
honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of  
mines and metallurgical works, mining engineers, geologists, metallurgists,  
or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves  
for the profession of mining or metallurgical engineering, students in pure  
and applied science in any technical school in the Dominion, and such other  
persons, up to the age of 25 years, who shall be engaged as apprentices or  
assistants in mining, metallurgical or geological work, or who may desire to  
participate in the benefits of the meetings, library and publications of the  
Institute. Student Members shall be eligible for election as Members after  
the age of 25 years.

### SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

### PUBLICATIONS.

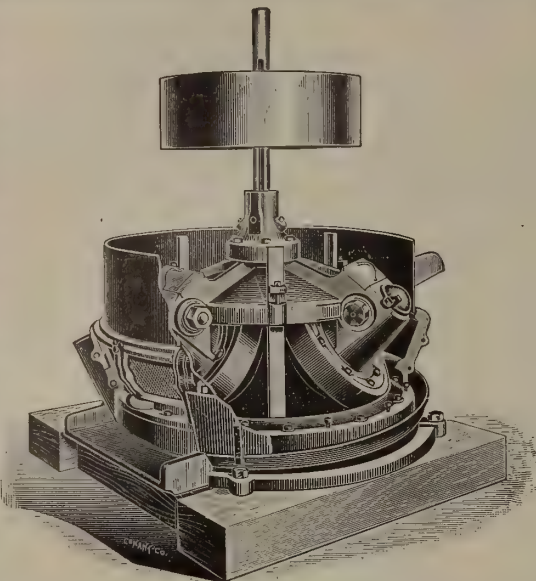
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone in-  
terested in promoting the profession and industry of mining without quali-  
fication or restrictions.

Forms of application for membership, and copies of the Journal of the  
Institute, etc., may be obtained upon application to

B. T. A. BELL, Secretary,  
Orme's Hall, Ottawa.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

**MONTREAL.**

Obtain our Prices.

# MINE RAILS

## Cable Hoist-Conveyors



MANUFACTURED BY

## THE TRENTON IRON CO.

TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.  
Also, Wire Rope Equipments for Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated Canadian Mining Institute.

Vols. I, II, III and IV Canadian Mining Institute.

**\$20** WILL be paid for a complete sett of these volumes. Readers having any, or all, of these copies for sale please write to

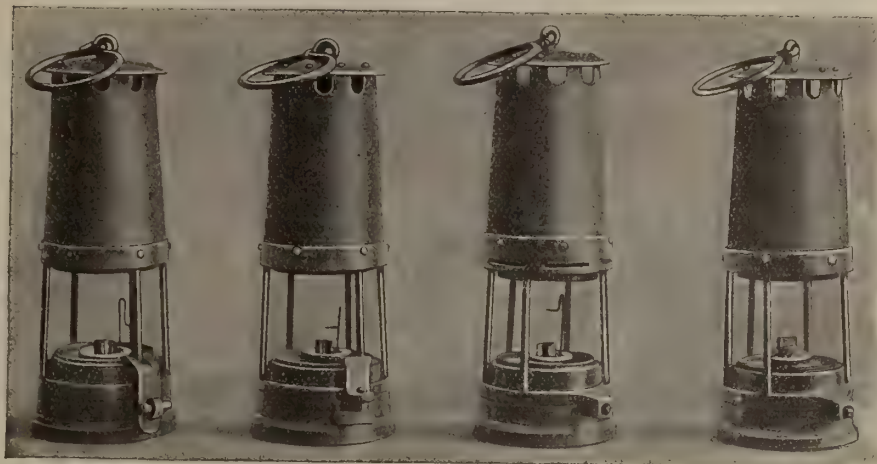
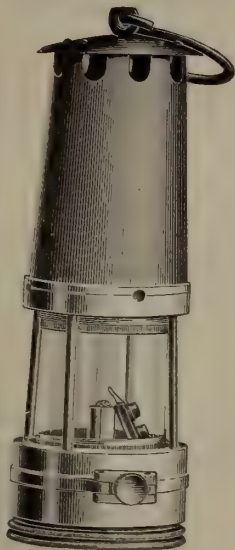
**The Canadian Mining Review**  
OTTAWA, Canada.



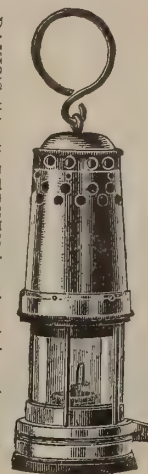
# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST MANUFACTURERS MINERS SAFETY LAMPS OF ALL KINDS

DAVIS'S PATENT ELECTRICALLY LIT LAMP TO BURN SPIRITS.



DAVIS'S "A.1" DEPUTY'S FIREBOSS'S AND SHOT-FIRER'S LAMP. DEPUTY'S "A.1" DEPUTY'S FIREBOSS'S AND SHOT-FIRER'S LAMP. DEPUTY'S "A.1" DEPUTY'S FIREBOSS'S AND SHOT-FIRER'S LAMP. DEPUTY'S "A.1" DEPUTY'S FIREBOSS'S AND SHOT-FIRER'S LAMP.



DAVIS'S "A.1" DEPUTY'S FIREBOSS'S AND SHOT-FIRER'S LAMP.

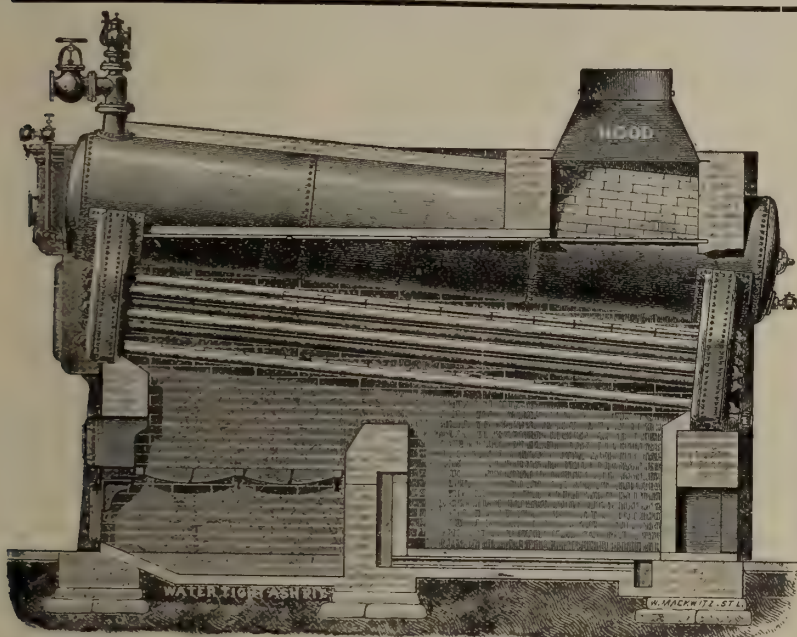
Stock at Montreal.

Sole Representative for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building MONTREAL.

Send for Catalogue and Prices.

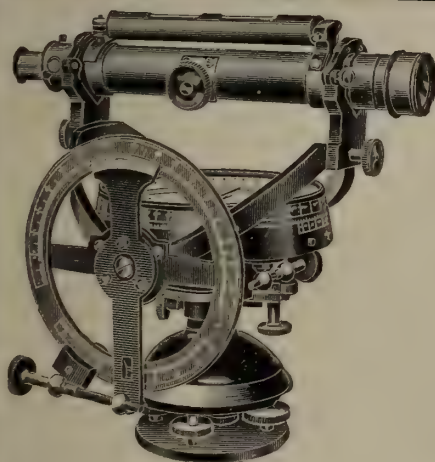


## HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co.  
TORONTO, ONT.

THE HEINE SAFETY BOILER—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head. Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

The Cumberland Railway & Coal Company

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

Head Office : 107 ST. JAMES STREET, MONTREAL

Address : P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction or 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





## PROVINCE OF NOVA SCOTIA.

### Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

### PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

#### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

#### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

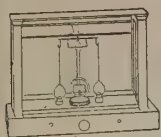
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.



## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.

### ASSAYERS and CHEMISTS SUPPLIES.

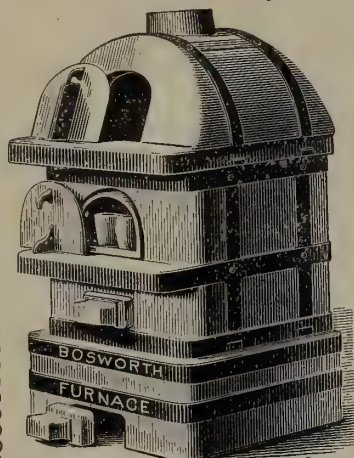
MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.



## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

### COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. . . .

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

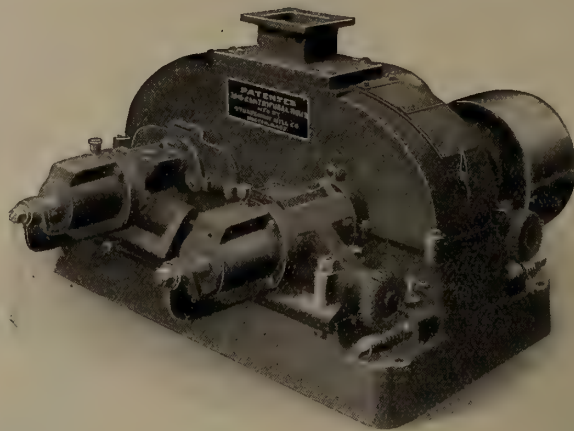
Munktell's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.

## Centrifugal Crushing Rolls



### TIRES CUSHIONED BY SPRINGS



PATENTED

PATENTED

Common Rolls are to spring-tired Centrifugals what the Dump Cart is to an up-to-date Rubber-tired carriage. Spring-pressed tires absorb crushing shocks. A cart, shaky enough at a walk, can scarcely hold together going faster on a road easy for a modern carriage.

If you are interested in a Roll constructed to LAST and turn out the largest product at the smallest expense, write for our catalogue of

### CRUSHING, GRINDING and SCREENING MACHINERY.

## STURTEVANT MILL CO.

BOSTON, MASS.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.



Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steal Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

**Montreal Pipe Foundry Co.**

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

Canada Life Building - MONTREAL.

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

**CANADA LIFE BUILDING, MONTREAL.**

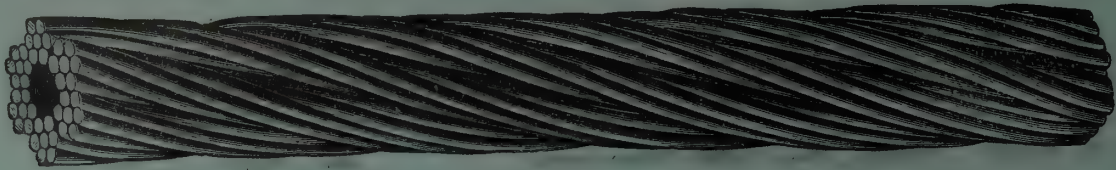
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

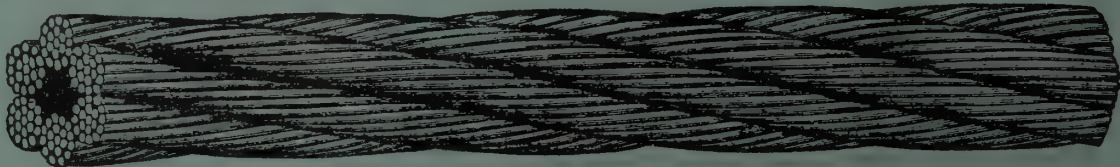
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard  
IMMEDIATE SHIPMENT.

LIGHT MINING RAILS  
12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
..IN STOCK..

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION

JAMES COOPER



TWENTY-FIRST YEAR OF PUBLICATION

# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. VI.

OTTAWA, JUNE 30th, 1903.

Vol. XXII—No. VI.



**THE CANADIAN RAND DRILL CO.**  
SHERBROOKE, QUE.  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.





ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

ROSSLAND, P.O. Building.



THE

# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

### COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

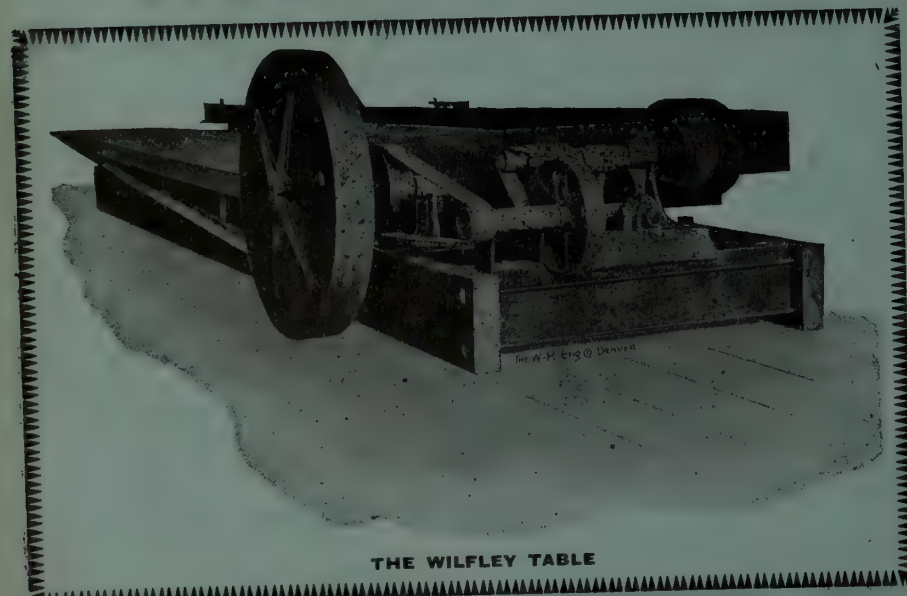
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.



HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative in Canada **FRANCIS T. PEACOCK, M. E.** 44 Canada Life Bldg., MONTREAL

**ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.**

**THE CANADA PATENT SELF-LOCKING CAM**

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

**CHROME STEEL WORKS,**  
KENT AVENUE, KEAP  
AND HOOPER STREETS,  
BROOKLYN, N.Y., U.S.A.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

**THOS. FIRTH & SONS, Ltd., Sheffield,**  
**Tool Steel and Rock Drill Steel**

ALWAYS CARRIED IN STOCK.



**SHOES AND DIES.**



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



**H. W. DeCOURTENAY & CO.**

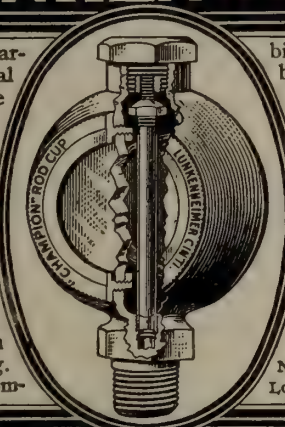
86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

**The LUNKENHEIMER**

Suitable for all movable bearings, is simple and practical in construction and can be filled without detaching plug. Glass sides show stage of oil. Attach cup so that the glass sides are parallel with the rod. When cup is in motion the oil begins to travel in a body within the cup, and at each revolution is thrown against the feed tube and flows down through it to the bearing. The centrifugal force, com-



bined with the shape of the body, carries the oil to the holes in the feed tube. A trial solicited and satisfaction guaranteed. Write for catalogue of superior brass and iron steam specialties. Specify "Lunkenheimer" make and order from your dealer.

**The Lunkenheim Co.**

Sole Makers and Patentees,  
CINCINNATI, OHIO, U. S. A.

BRANCHES:

NEW YORK: 26 Cortlandt Street.  
LONDON: 85 Great Dover Street.

**"CHAMPION" ROD OIL CUP**

**C. L.  
BERGER  
& SONS**

37 William Street  
BOSTON, Mass.

SUCCESSORS TO

**BUFF & BERGER.**

SPECIALTIES:

Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE



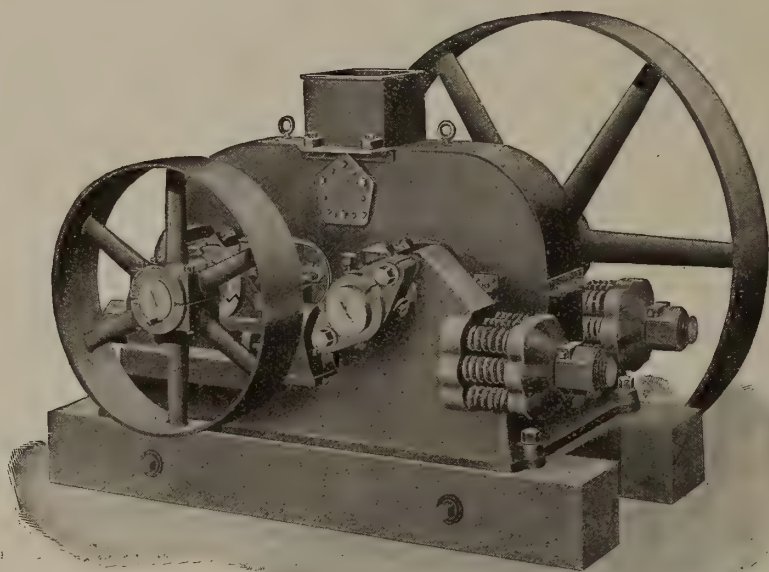
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'F'G CO.,  
SCRANTON, PA.

BUILDERS OF

## MINING MACHINERY



STYLE B CRUSHING ROLL.

### Crushing Rolls

Our standard line of crushing rolls consists of three styles, as follows:

Style A. (Formerly known as Gates High Grade Roll).

Style B. (Formerly known as Fraser & Chalmers Standard Roll).

Style C. (Formerly known as Fraser & Chalmers Belt Roll).

We aim to carry in stock all standard sizes of the above named rolls, and also keep on hand a full line of repair parts for same. All special sizes of these rolls mentioned above and crushing rolls formerly built by the constituent companies will be built upon special order. We are also prepared to furnish repair parts on special order for crushing rolls formerly manufactured by the constituent companies.

Builders of

### Gates Rock and Ore Breakers. Chilian Mills

### Huntington Mill. Blake and Dodge Crushers

## BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

## GENERAL

### CHICAGO,

LONDON, ENG., 160 Dashwood House



## OFFICE

### ILL., U.S.A.

JOHANNESBURG, South Africa

## BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hemmen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

SUCCESSOR TO

LARGEST BUILDERS IN THE WORLD OF

## ROASTING FURNACES



Allis-Chalmers Co. controls the sole and exclusive right of manufacture and sale of the Brown Roasting Furnaces, Jackling Roasting Furnaces, Wetthey Roasting Furnaces, McDougall Roasting Furnaces.

The Brown Straight Hearth Roasting Furnace is built of different lengths, having roasting hearths from 100 to 200 feet long and 10 feet wide.

The Brown Circular or Oval Roasting Furnace (horse-shoe type), is often built with a cooling hearth.

The Jackling Roasting Furnace has a roasting hearth from 100 to 200 feet long by 12 feet wide.

The Wetthey Roasting Furnace has a roasting hearth 121 by 12 feet, with cooling hearth underneath the roasting hearth.



The McDougall Roasting Furnace is a vertical brick cylinder encased in iron, and has six roasting hearths each 14½ feet in diameter, placed one above the other.

All Ores and Mattes in a pulverized condition which require roasting for subsequent metallurgical operations can be satisfactorily roasted in any of the above mentioned furnaces. Sizes, cost and other information cheerfully furnished.

### BRANCH OFFICES:

NEW YORK, Broad Exchange Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

### GENERAL

CHICAGO,

LONDON, ENG., 160 Dashwood House.



### OFFICE

ILL., U.S.A.

JOHANNESBURG, South Africa

### BRANCH OFFICES:

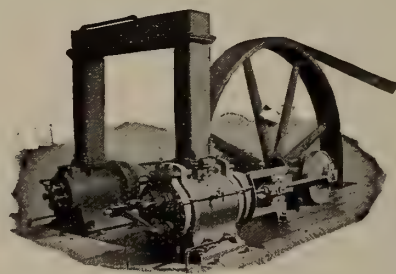
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO



Class B-D Compressor  
[Air Cylinders next to Frame]



Compound Belt-Driven Compressor

## AIR COMPRESSORS



Duplex (Meyer-Valve) Compressor



Straight Line Belt Driven Compressor



Cross-Compound Corliss Compressor

**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-  
ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.

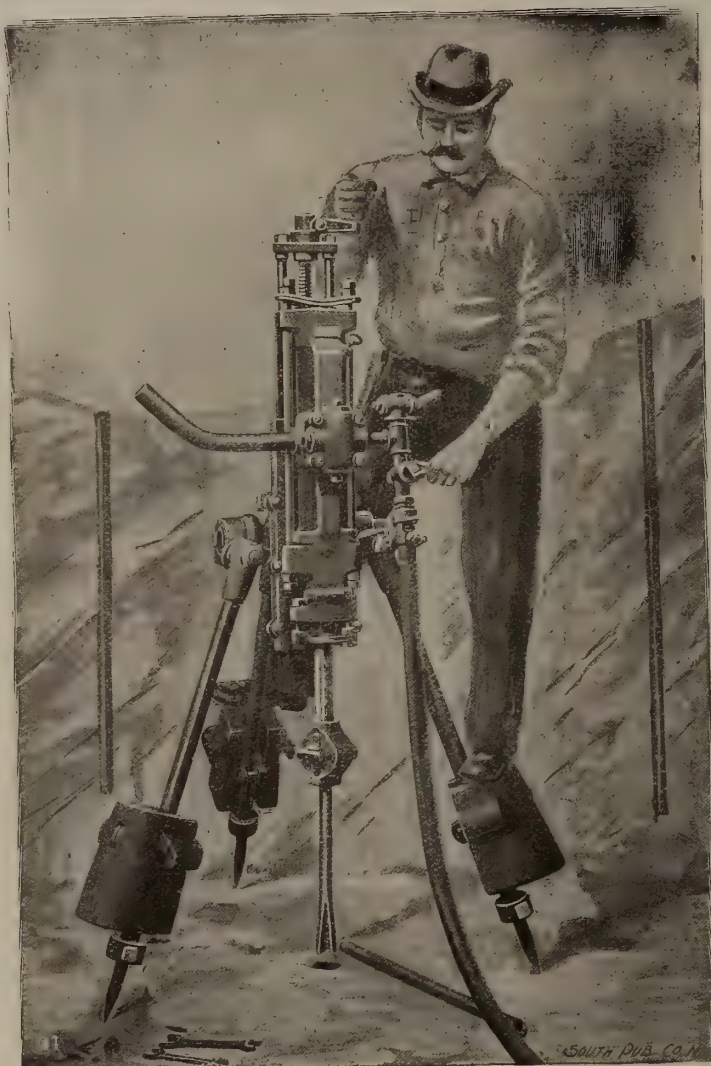


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

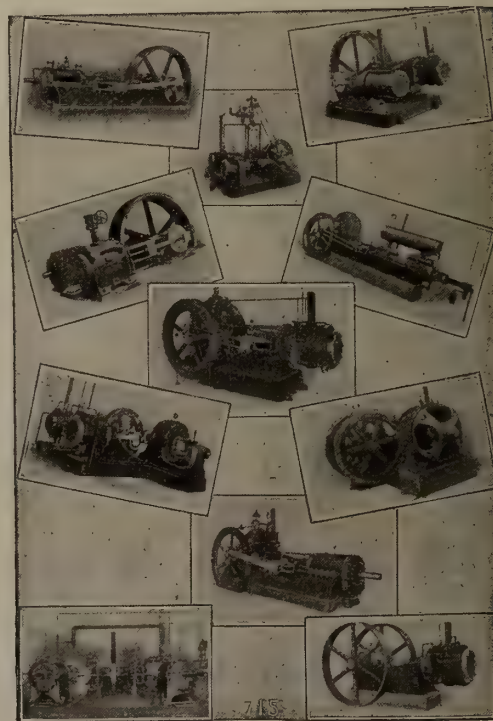
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



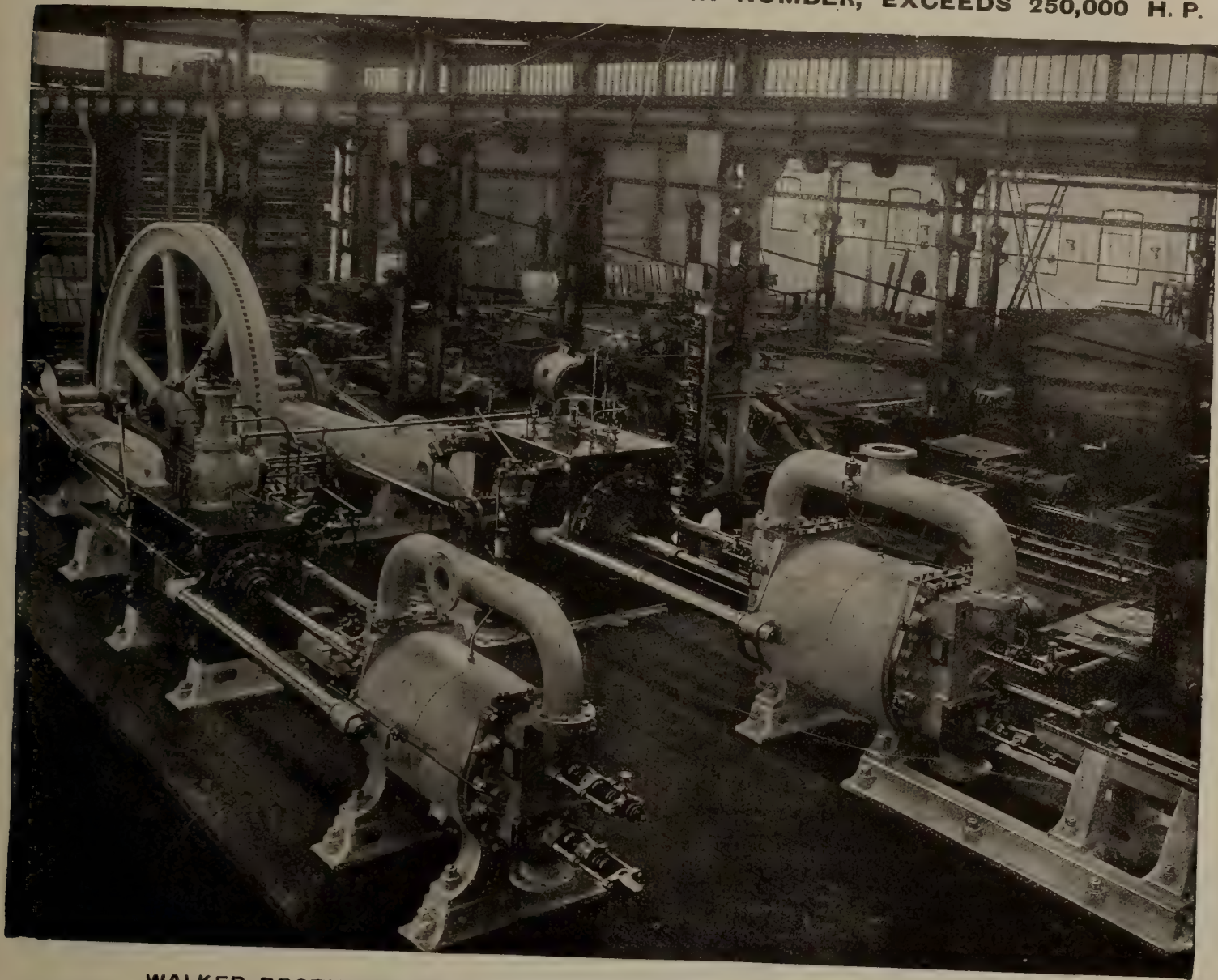


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIR,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.  
May 10th, 1897.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

### J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

## CARBONS (BLACK DIAMONDS)

AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$  to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$  to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASCOW, N.S.



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

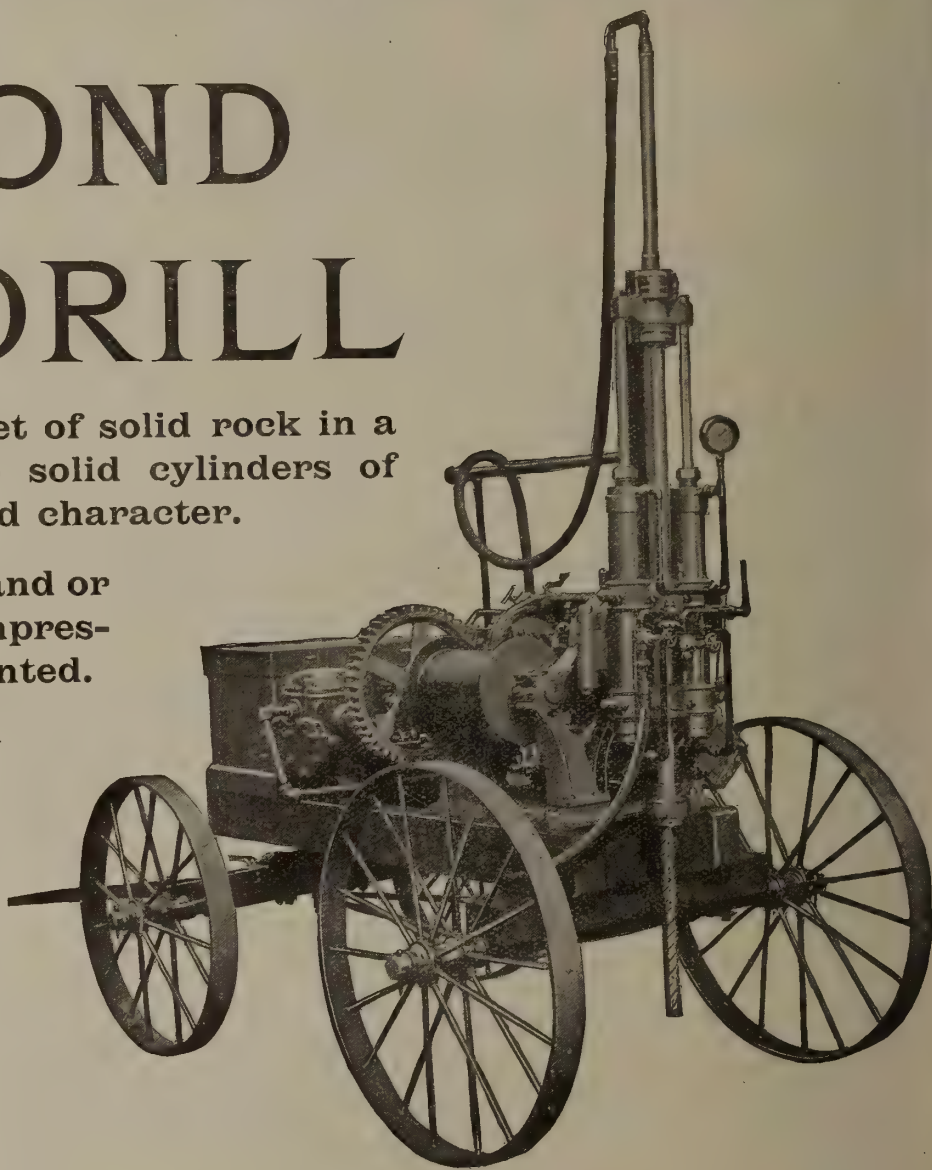
It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

---

You will find lots of information in our new catalogue—may we send it?

---



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# SULLIVAN

## Sullivan Rock Drills

**Economical**

**Rapid**

**Durable**

Sullivan 2 and 2¼-inch Air Drills are favorites for all light mining work.



Two 2¼-inch Sullivan Drills working on 900-foot level of the Congress Mine, Congress, Arizona.

With one of these Drills, one man can do as much work as six men with hand hammers.

# MACHINERY CO.

NEW YORK  
PITTSBURG

135 Adams Street, CHICAGO  
U. S. A.

DENVER, Colo.  
SPOKANE, Wash.  
EL PASO, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS:

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

### Head Office: MONTREAL, Que.

**JAS. P. CLEGHORN,**  
 President.

**CHARLES FERGIE,**  
 Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
 Secretary-Treasurer.



# ..COAL..

## DOMINION COAL COMPANY, LIMITED

Glance Bay, C.B. Canada

### MINERS OF

#### BITUMINOUS COALS

The celebrated "Reserve"  
coal for Household use.

#### "INTERNATIONAL" GAS COAL

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

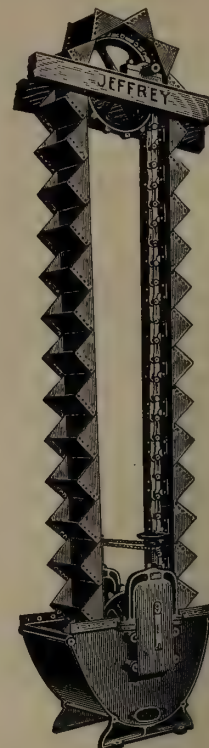
COAL CUTTERS

Power Drills

Screens

Crushers

Conveyors, Etc.



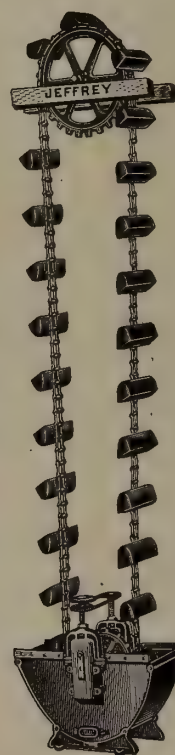
JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company** Columbus, Ohio, U.S.A.  
41 Dey St., New York.



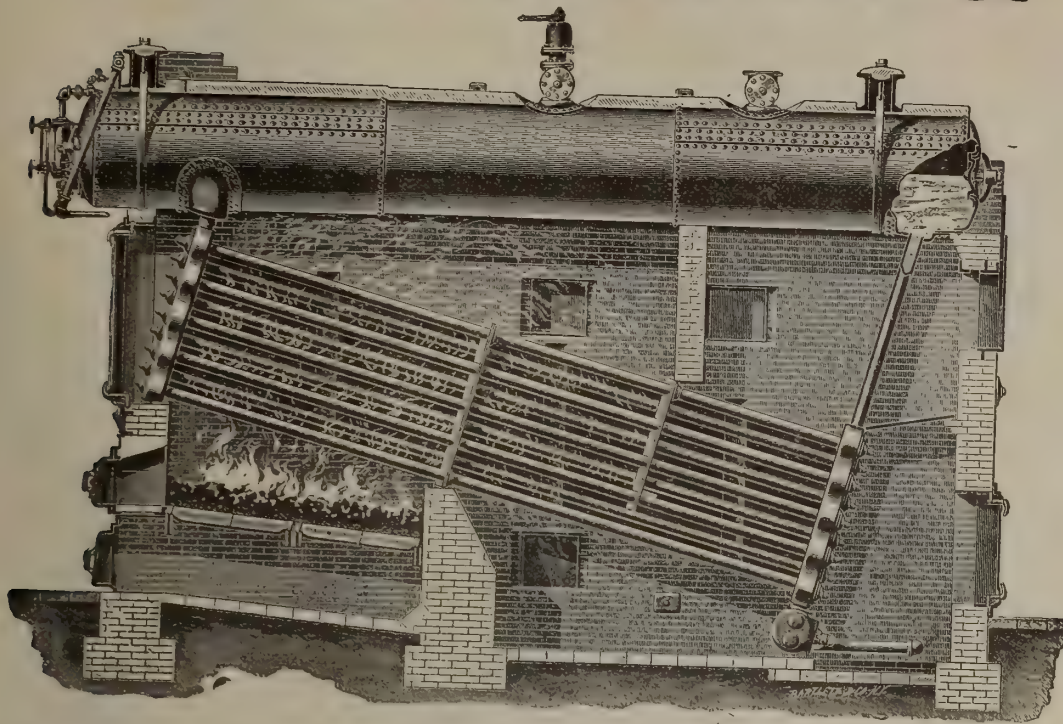
**WILLIAMS & WILSON**  
MONTREAL AGENTS

NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



WATER TUBE

**STEAM . . .  
BOILER . .**

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

**Caledonian Iron Works Co. Limited**

**MONTREAL, Que.**

**BOILERS**

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

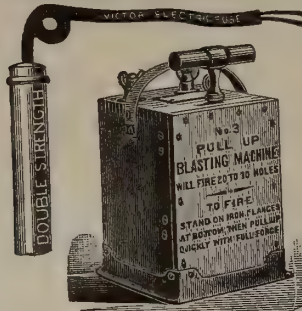
GENERAL AGENTS  
IN CANADA FOR

**WORTHINGTON PUMPS**

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**



SEND FOR  
CATALOGUE

# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For Miners Pit Sinkers **DYNAMITE AND EXPLOSIVES** For Quarrymen Contractors

... Manufacturers and Dealers in ...

**ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.**

**ONTARIO POWDER CO. Limited** 176 ONTARIO STREET Kingston, Ont.

DAN'L SMITH, President.  
C. A. MACPHERSON, Sec.-Treas.

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and Lachine Locks, P.Q.

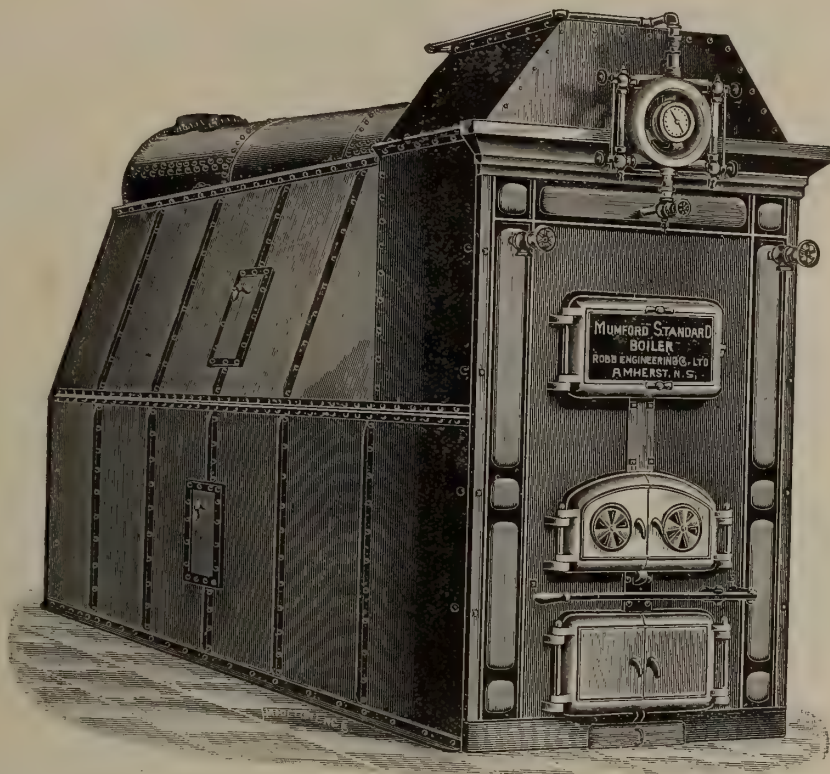
# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works. **OTTAWA**



## The Mumford Standard Boiler



### Proved a Success

This boiler has been built by us for several years, and is used from the Atlantic to the Pacific with most satisfactory results. It combines, to a remarkable extent, the best features of other types of boilers.

### Saves Fuel

The firebox is entirely surrounded by water so that no heat is lost by radiation or by air leakage which takes place in brick-set boilers. An internal furnace saves at least 10 per cent. over an external furnace.

### Perfect Circulation

The boiler consists of an upper and lower drum connected by two necks giving continuous and rapid water circulation. This causes the water to absorb more heat and makes the expansion uniform.

### Easily Cleaned

Two settling chambers are provided for catching deposits of scale making material, and all parts of the boiler are accessible for cleaning.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**AGENTS :** WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.

2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN  
GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

#### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

#### GROUP III.

- (h) Biology and Public Health.

3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
October 1st, 1902.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE

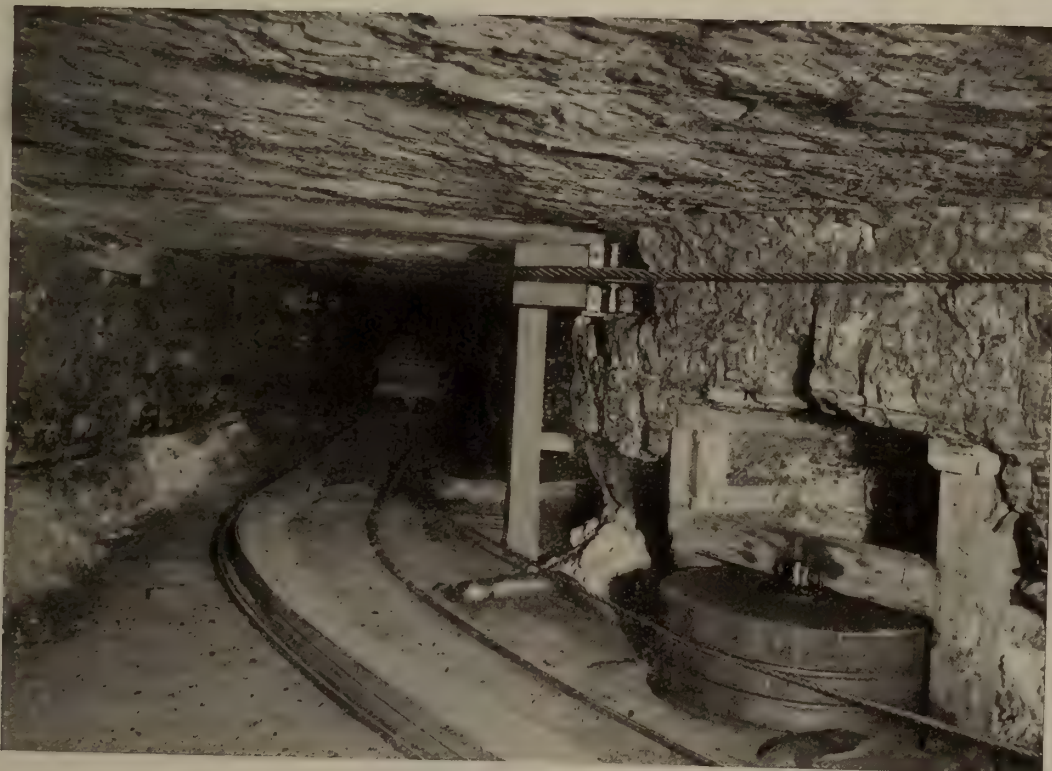


WORN  
B.B.B.  
MAKE

WE MANUFACTURE

## WIRE ROPE

FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# MINING SUPPLIES OF ALL KINDS

PICKS SHOVELS WIRE ROPE CHAIN  
 DYNAMITE POWDER DETONATORS FUSE  
BAR IRON STEEL DRILL STEEL IN LONG AND SHORT LENGTHS  
 STEAM & COMPRESSED AIR HOSE HARDWARE  
 PIPE VALVES FITTINGS ETC.

**RICE LEWIS & SON**  
 LIMITED  
 TORONTO  
 HARDWARE

**THE BUCYRUS COMPANY**

SOUTH MILWAUKEE, WISCONSIN.

**STEAM SHOVELS AND DREDGES.**

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.  
 RAILROAD WRECKING CARS AND PILE DRIVERS. CENTRIFUGAL DREDGING PUMPS.

**A. LESCHEN & SONS ROPE CO.**  
 SOLE MANUFACTURERS OF

Patent Flattened  
 Strand Wire Rope



Trade Mark Registered  
 REMEMBER! All genuine Hercules Wire Rope has a Red Strand.

**LESCHEN'S** Aerial Wire Rope **TRAMWAYS**

Wire Rope, Manila, Sisal Rope, Wood, Iron and Steel Blocks of every description

HOME OFFICE: 920-922 No. First St., St. Louis, Mo.

BRANCHES: New York, Chicago, San Francisco.

**School of Practical Science, Toronto**

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

**L. B. STEWART, Secretary.**



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.

ADDRESS LETTERS:  
**LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.**

Telegraphic Address:  
LOBNITZ, RENFREW      A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

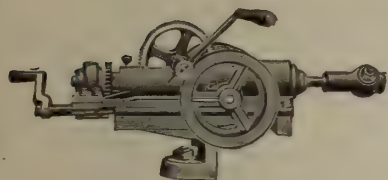
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

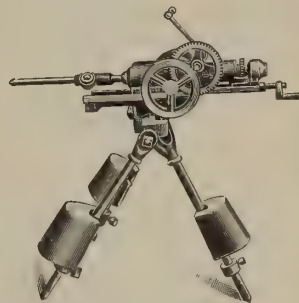
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.

## The Colorado Iron Works Co.

DENVER, COLO.



LEACHING TANK USED IN PNEUMATIC CYANIDE PROCESS  
SHOWING AIR PIPES, FILTER AND FALSE BOTTOM.

have purchased a controlling interest in the

**Pneumatic Cyanide Process Company**

and the patents protecting said Process all over the world.

No up-to-date mine owner or manager can afford to use the old, slow and wasteful method when he can get the use of the Pneumatic Process at a merely nominal cost.

**The Colorado Iron Works Company**

are now prepared to build the best Cyanide Plants ever erected, and, if desired, run them for a specified time, before delivery to the purchaser.

WRITE FOR ESTIMATES OR FURTHER  
INFORMATION TO

**The Colorado Iron Works Co.**  
DENVER, Colo.



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL

FOR  
NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and  
Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

**GEO. G. BLACKWELL, SONS & CO. LTD.**  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building  
16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and  
M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to  
538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**  
CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**  
CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**

28 years' experience in the equipment and operation of large Hydraulic, Deep Gravel, Drift and Gold Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

MONTREAL TESTING LABORATORY.

**MILTON L. HERSEY, M.A.Sc. (McGill)**

CONSULTING CHEMIST OF THE

CANADIAN PACIFIC RAILWAY COMPANY.

146 St. James Street

MONTREAL

**ASSAYS OF ORES**

ANALYSES of all materials made with greatest accuracy.

SAMPLES BY MAIL—1 cent per 4 ozs.; limit 24 ozs.

INSTRUCTION IN ASSAYING, Etc., to Prospectors and others.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**  
CIVIL AND MINING ENGINEER  
30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals (earthy and metalliferous), Artesian Wells and Oil Springs, also Deep Soundings for Harbors, Rivers, Canals, Tunnels and Bridge Foundations. Quarry Sites and Clay Fields tested.

Plans and Sections made showing result of Borings—Gold Drifts tested to Ledge by the new Pneumatic and Hydraulic Tube System and the yield ascertained—Flumes, Ditches, Monitors and Placer Mining Plant generally designed and constructed. Properties Examined and Reported on, Assays made.

**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and reported on. Plans and Estimates on Concentrating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,

MONTREAL.

Analyses and Assays of Ores, Fuels, Furnace Products, Waters, etc. Mines and Mining Properties examined and valued.

**FRANK B. SMITH, B.Sc.**

CIVIL AND  
MINING ENGINEER

Certificated Colliery Manager Great Britain and British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**

MINING  
ENGINEER

No. 45 Broadway

NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**

Civil and Mining  
Engineers.

Surveyors and  
Valuers.

8-KING STREET-8

MANCHESTER, ENGLAND.

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.

**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.

Superintends the erection of Mining and Milling Plants.

**J. C. GWILLIM, B.Sc.**

MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**

MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**

CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation.

Reports.

Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

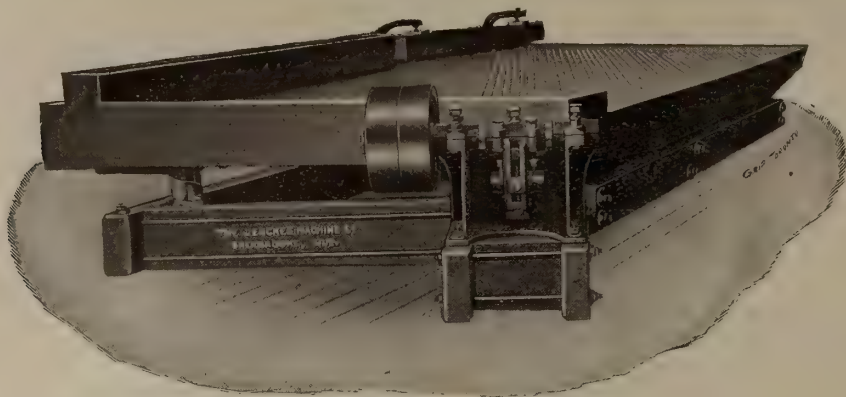
PLANT FOR PUBLIC WORKS.

GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.





### The Overstrom Diagonal Concentrating Table

We have received repeat orders from numerous customers for this table, for the reason that for **Clean Concentration** and **Close Separation** it has no equal.

A postal brings you a catalog.

## THE JENCKES MACHINE COMPANY

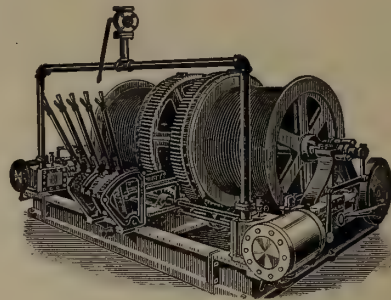
Halifax Montreal  
Rossland

**SHERBROOKE**  
571 LANSDOWNE ST.

Toronto Winnipeg  
Greenwood

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels  
for Dredging, Dykeing, Ditching, GOLD  
MINING, Etc., of various Styles and  
Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**  
MONTREAL, QUE. ST. JOHN, N.B.



# WIRE ROPE

All kinds and sizes, and for all purposes.

Standard and Lang's Patent Lay.

PRICES RIGHT. PROMPT SHIPMENTS.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.

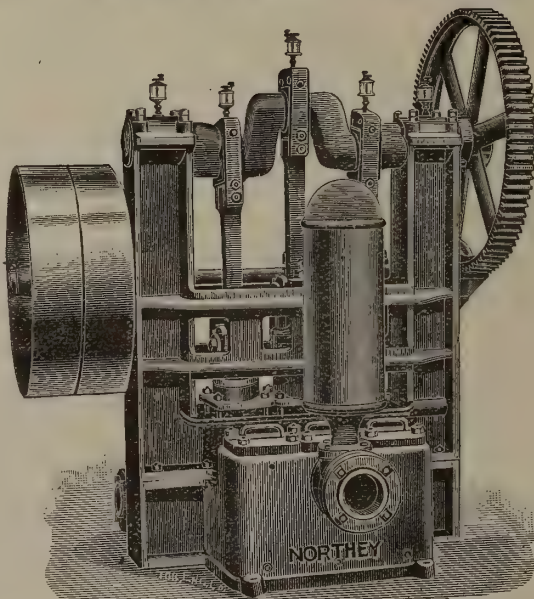
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 6.

JUNE, 1903.

VOL. XXII., No. 6.

## BURNT OUT.

By the complete destruction of our printing plant in the great fire which occurred in Ottawa early in the month, the work of publishing the present number of the "Review" has been difficult, and we beg the indulgence of our readers for the shortcomings of the present number.

### Ontario and the Iron Trade.

Ontario aspires to be the chief manufacturing Province of the Dominion, to fill in Canada the role which the New England States or Pennsylvania plays in the great Republic. There are vast markets looming up in the western prairies and ranches, as well as in the forests of the north, where the thousands of pioneers will soon give place to millions of successors, who will demand manufactured goods in almost unlimited quantities. Textile fabrics in cotton and wool, furniture and woodenware, boots and shoes and leather goods of all kinds, machinery and manufactures of iron and steel all in a thousand varied forms will be needed to clothe the persons, do the work and meet the wants of this coming host whose skirmishing line is even now upon us.

Not the least in demand will be articles of steel and iron, without which forests cannot be felled, fields cultivated or reaped, houses built, or produce taken to market. Abundance of iron lies at the base not only of the special branches of manufacture of which it is the raw material, but of manufactures of all kinds, because they cannot be made without machinery.

The production of agricultural implements is a business which, in a farming country like Canada, is likely to come early to the front. For many years large firms, mainly in Ontario, have been not only supplying machinery to Canadian farmers, but have been exporting it in quantities to foreign countries. The location of a branch of the Deering manufacturing firm in Hamilton seems likely to lead to the erection of a plant which will put existing works in the shade, and to give the "ambitious city" a strong lead towards industrial primacy among Ontario cities. The motive for putting up a plant on Canadian soil, which when completed will, it is said, employ probably ten thousand men, is probably a double one—to take early advantage of western development, and to manufacture for foreign countries free from the disabilities to which retaliatory tariffs expose the manufacturers of the United States. The erection of sugar factories, cereal works, cement plants, steel works, shipyards, etc., in many Ontario towns and cities,

encouraged as they have been in many cases by municipal bonuses, shows clearly the trend towards the business of manufacturing in Ontario.

Do the conditions in Ontario prevail in Ontario necessary for the development of a great manufacturing industry, especially in goods made mainly from iron and steel? The great lakes invite commerce and furnish the means of transporting commodities from the older parts of the Province where manufacturing can be most successfully carried on, right up almost to the threshold of the markets of Manitoba and the west. It is by reason of these unrivalled waterways that the trade between the older and newer States of the Union has developed to so enormous an extent, and there is no doubt that what is done on the southern side of the lakes can be repeated on the north. Iron ore can be brought down from the upper lakes from mines either north or south of the line just as easily to Ontario as to American ports, and if the volume of the trade should require it, loading and unloading and dockage facilities equal to those at American ports would be provided. Western bound coal destined for the Canadian side and manufactured goods would afford return cargoes, just as they do south of the line. The position of Ontario, thrust like a wedge into the heart of the American Republic, bounded as it is by the great lakes and within a few hours distance of the great centres of population south of the border, confers upon it unique advantages for trade, commerce and manufactures. So far as transportation is concerned, there can be no doubt that Ontario is capable of becoming the seat of a great manufacturing industry.

As to supplies of iron ore, it is doubtful whether in any commonwealth of America so great an extent exists of rocks favorable for the occurrence of ore deposits. Already a number of important mines have been located both of hematite and magnetite, and there is every reason to believe that many more await the revealing touch of the prospector's pick or the diamond drill. It is premature to say that supplies of ore on a vast scale do exist, for iron range rocks often contain no iron, but the chances of so extended an area proving barren are practically nil, and it will not be surprising if within the next five or six years iron mines are developed in northern and northwestern Ontario on a scale comparable to almost any other locality.

The matter of fuel is an important one, and of course there is no denying that Ontario, at any rate older Ontario, is without coal mines, but coke and coal can be brought from Pennsylvania at very little greater cost to Canadian ports on the great lakes than to American ports, and the tendency appears to be growing to bring the coke to meet the ore, and not to carry the ore the whole way to the coke.



There is no good reason for instance why a blast furnace or steel works should not be as successful on the north side of Lake Erie as on the south, for the cars containing the coke can be ferried across and thus save handling, which tends to reduce the value of coke for smelting purposes.

The manufacture of charcoal iron ought to find northern Ontario a very favorable seat. There is abundance of wood and plenty of ore, and our iron masters would do well to examine carefully the possibilities of this branch of the industry.

Water falls for the production of electrical power are numerous, and can be utilized for mining and manufacturing operations with great economy and advantage. Indeed, a beginning has been made in this direction in some of the working mines of the Province.

To sum up, the conditions are, (1) an enormous market rapidly developing; (2) abundance of iron ore; (3) coal and coke at very little over U. S. prices, and charcoal *ad libitum*, with additional advantages in the way of cheap electrical power. We have not dealt with artificial aids such as tariff duties or bounties, as these are at the mercy of political changes, but on the strictly natural conditions there seems to be no reason whatever why with skill, energy and capital an iron and steel trade of very large dimensions should not come into existence in the Province of Ontario, and that within a very short time.

#### Production of Pig Iron in Canada.

The statistics of the production of pig iron in Canada in 1902 have been received from the manufacturers by the American Iron and Steel Association. They show an increase of 74,581 long tons, or over 30 per cent., as compared with the production in 1901.

The total production in 1902 amounted to 319,557 long tons, against 244,976 tons in 1901 and 86,090 tons in 1900. In the first half of 1902 the production was 157,804 tons and in the second half it was 161,753 tons, a gain of only 3,949 tons. Of the total product in 1902, 302,712 tons were made with coke and 16,845 tons with charcoal. A little over one-third of the total product was basic pig iron, namely, 107,315 tons. The Bessemer pig iron made amounted to about 9,000 tons. Spiegeleisen and ferromanganese have not been made since 1899.

The following table gives the total production of all kinds of pig iron in Canada from 1894 to 1902, the statistics for each year having been received directly from the manufacturers. Prior to 1894 the statistics of pig iron production in Canada were not collected by the American Iron and Steel Association:

*Total production of all kinds of Pig Iron in Canada, 1894-1902.*

| Year      | Quantity.         |
|-----------|-------------------|
| 1894..... | 44,791 long tons. |
| 1895..... | 37,829 "          |
| 1896..... | 60,030 "          |
| 1897..... | 53,796 "          |
| 1898..... | 68,755 "          |
| 1899..... | 94,077 "          |
| 1900..... | 86,090 "          |
| 1901..... | 244,976 "         |
| 1902..... | 319,557 "         |

On December 31, 1902, the unsold stocks of pig iron in Canada amounted to about 20,000 long tons, as compared with 59,472 tons at the close of 1901 and 12,465 tons at the close of 1900. Of the unsold pig iron on hand on December 31, over 19,000 tons were coke pig iron.

On December 31, 1902, Canada had 14 completed blast furnaces, of which 7 were in blast and 7 were idle. Of this total, 9 were equipped to use coke for fuel, 4 to use charcoal, and 1 to use mixed charcoal and coke. In addition, 4 coke and 2 charcoal furnaces were

being built or were partly erected on December 31, but work on some of these furnaces was suspended.

The Algoma Steel Company, Limited, of Sault Ste. Marie, Ontario, one of the constituent companies of the Consolidated Lake Superior Company, commenced the erection of 2 charcoal and 2 coke furnaces at Sault Ste. Marie in 1901. The charcoal furnaces were to be 70 by 14 feet and the coke furnaces 90 by 21 feet. Subsequently work on the coke furnaces was suspended, and one of the building charcoal furnaces was converted into a coke furnace, the size being changed from 70 by 14 feet to 80 by 15½ feet. The company now expects to have its charcoal furnace ready for blast in June and its coke furnace in July.

The Cramp Steel Company, Limited, has put in the foundations for a blast furnace at Collingwood, Simcoe County, Ontario. The company expects to have the furnace ready for operation in the fall of 1903. Coke will be used. Its daily capacity will be about 250 long tons.

The Nova Scotia Steel and Coal Company, Limited, of New Glasgow, Nova Scotia, broke ground in June, 1902, for a new furnace at Sydney Mines, Cape Breton, Nova Scotia. The furnace will be 85 by 17 feet, and will have a daily capacity of about 200 tons of basic and foundry pig iron. Coke will be used, and red and brown hematite ore will be obtained from Nova Scotia and Newfoundland. It is expected that the furnace will be completed in September, 1903. The company now has a furnace at Ferrona, with an annual capacity of 33,000 long tons.

The Londonderry Iron and Mining Company, Limited, of Londonderry, Nova Scotia, is rebuilding Furnace A, at Acadia Iron Mines, and expects to blow it in in May, 1903. The furnace will be 75 by 17 feet, and will have an annual capacity of 48,000 tons of foundry iron. The company does not contemplate blowing in Furnace B in the near future, but may rebuild it later on.

The total production of steel ingots and castings in Canada in 1902 was 182,037 long tons, against 26,084 tons in 1901, an increase of 155,953 tons. Bessemer and open-hearth steel ingots and castings were made in each year. Almost all of the open-hearth steel reported in 1902 was made by the basic process.

The following table gives the production of all kinds of steel ingots and castings in Canada from 1894 to 1902, in long tons:

| Year      | Quantity          |
|-----------|-------------------|
| 1894..... | 25,685 long tons. |
| 1895..... | 17,000 "          |
| 1896..... | 16,000 "          |
| 1897..... | 18,400 "          |
| 1898..... | 21,540 "          |
| 1899..... | 22,000 "          |
| 1900..... | 23,577 "          |
| 1901..... | 26,084 "          |
| 1902..... | 182,037 "         |

The large increase in the production of steel in Canada in 1902 over 1901 was caused by the starting up of the new open-hearth steel plant of the Dominion Iron and Steel Company, Limited, at Sydney, Cape Breton, Nova Scotia, which first produced steel on December 31, 1901, and of the new Bessemer plant of the Algoma Steel Company, Limited, at Sault Ste. Marie, Ontario, at which steel was first made on February 18, 1902. The latter company has two 6-long-ton Bessemer converters, which were operated for a few months in 1902, producing in all 44,537 long tons of ingots. The company has also a rail mill which first made Bessemer steel rails on May 5, 1902, and which also ran for a few months in that year, producing 32,878 long tons. In addition this company also produced 1,236 long tons of other rolled products in 1902. The Dominion Iron and Steel Company produced 99,425 long tons of basic open-hearth steel ingots and castings and 86,424 tons of blooms, billets, and slabs. It did not make steel rails.



### Dominion Steel.

Since the publication of our article last month on the affairs and management of the Dominion Iron and Steel Company, we are in receipt of an exceedingly interesting communication from a gentleman who has been from the start prominently identified with the iron and steel industries of the Maritime Provinces. Whilst our correspondent's communication was not intended for publication, perhaps he will pardon us reproducing for the benefit of our readers the following extract:

"If the cost of producing pig iron at Sydney is between \$10.00 and \$11.00 it is a great deal more than it ought to be and considerably higher than Ferrona iron cost when using the same ore, with dearer coal, longer transportation and a small furnace. If there has been a marked decrease in the value of their Wabana ore, and metallic contents have fallen as low as 43 per cent., this is due entirely to the method of mining, and not to any change in the iron contents in the ore body *en suite*—that statement you can depend upon. The lower bed which they purchased, however, did not average 55 per cent. throughout—it did, however, average over 50 per cent. The falling off of the metallic contents of the ore as shipped to the furnace does not, of itself, involve the necessity of importing large quantities of high grade ore as stated. As a matter of fact, the Sydney people have never used foreign ore of any kind for the production of Basic pig iron for open hearth purposes, the foreign ore imported was used exclusively for two purposes—in one case to mix with Wabana to gain a lower phosphoric iron for foundry purposes, and in the other case as a reducing agent in the open hearth furnaces.

With regard to what you refer to as the fundamental difficulty arising from an unsuitable ore and the consequent inability to produce a rail to come up to Mr. Fielding's requirements as to quality, I wish to say that the Sydney people in their open hearth furnaces, are making to-day and have been for months, from Wabana ore entirely, without any admixture of other materials whatever, billets which are filling the most exacting requirements for locomotive material, such as driving axles for the Baldwin Locomotive Company of Philadelphia, the physical and chemical specifications for which are much more severe than called for in any steel rails made either in the United States, Great Britain or elsewhere—of that fact there is no possible doubt whatever. All that is said in regard to their inability to make steel rails of the necessary quality from Wabana Ore, pure and simple, is nonsense. Briefly, what I say is, that there has been no deterioration in the ore *en suite*, and that from this ore alone, without any other material whatever, steel of the very highest grade has been, and can be made. That their costs are high there can be no question. This is due not only to one or two but to several reasons and it will take some time to bring them down."

### Cost of Electric Drilling.

Mr. John B. Hobson, M.E., general manager of the Consolidated Cariboo Hydraulic Mining Company at Bullion, B.C., in his annual report, gives some interesting figures of costs of operating an installation of Gardner electric drills. The plant, which was an experimental one, included four Gardner No. 15 drills with two horse-power 110 volt direct current portable motors, one Gardner "B" drill, with one and a-half horse-power 110 volt direct portable motor, all complete, with seven-foot flexible shafts, adjustable tripods, drifting columns, the necessary flexible cables, working tools and five sets of drills of suitable lengths to drill holes, varying from two to eight feet deep. Mr. Hobson states that these drills proved a decided success, for they were run at low expense and proved more efficient than expected:—

### STEAM POWER.

|                                          |               |
|------------------------------------------|---------------|
| 1 cord of Cedar wood, delivered.....     | \$2 25        |
| 1 Electric Engineer .....                | 4 00          |
| Lubricants for Engine and Generator..... | 0 35          |
|                                          | <b>\$6 60</b> |

### OPERATING THREE DRILLS.

|                                        |              |
|----------------------------------------|--------------|
| 3 Power Drill Men at \$4.00 each ..... | \$12 00      |
| 3 Helpers at \$2.00 each .....         | 6 00         |
| 1 Blacksmith .....                     | 4 00         |
| 1 Helper .....                         | 2 00         |
| 3 Bushels of Charcoal at 25c.....      | 0 75         |
| Lubricants .....                       | 0 20         |
|                                        | <b>24 95</b> |

Total cost of running three drills 10 hours..... **\$31 55**

The duty attained by the Gardner drills used during the season, in advancing and lowering the bed-rock cut, averaged 312 feet of holes per 10-hour shift.

The duty attained by two-miners drilling by hand, with  $\frac{7}{8}$  inch steel and 8-lb. hammers, averaged about 141 $\frac{8}{10}$  feet per 10-hour shift, and made the cost of drilling 312 feet of holes in bed-rock by hand as follows:—

|                                     |         |
|-------------------------------------|---------|
| 42 Miners at \$2.00 per day.....    | \$84 00 |
| 1 Blacksmith at \$4.00 per day..... | 4 00    |
| 1 Helper at \$2.00 per day.....     | 2 00    |
| 4 Bushels of Charcoal at 25c.....   | 1 00    |

Total cost of drilling 312 feet of holes by hand..... **\$91 00**  
 Saving made in favor of power drills per ten-hour shift..... **50 45**

### Imports of Mining Machinery.

The imports of free and dutiable mining and smelting machinery for the first quarter of the present year compared with 1902, are as follows:—

| MONTHS         | 1903      |          |          | 1902    |          |         |
|----------------|-----------|----------|----------|---------|----------|---------|
|                | Free      | Dutiable | Total    | Free    | Dutiable | Total   |
| January .....  | \$ 77,298 | \$ 7,676 | \$84,974 | 92,984  | 2,549    | 95,533  |
| February ..... | 30,106    | 1,587    | 31,693   | 43,123  | 2,380    | 45,503  |
| March .....    | 83,535    | 11,534   | 95,069   | 55,255  | 2,629    | 57,884  |
| April .....    | 104,967   | 4,638    | 109,605  | 61,227  | 5,087    | 66,314  |
| Total.....     | 295,906   | 25,435   | 321,341  | 252,589 | 12,645   | 265,234 |

The principal sources from which this machinery has been imported were:—

| MONTHS         | UNITED STATES |          | GREAT BRITAIN |          | Other Countries | TOTAL    |
|----------------|---------------|----------|---------------|----------|-----------------|----------|
|                | Free          | Dutiable | Free          | Dutiable |                 |          |
| January .....  | \$75,235      | \$ 7,676 | \$ 417        | —        | \$1,646         | \$84,974 |
| February ..... | 29,467        | 1,587    | 639           | —        | Nil             | 31,693   |
| March .....    | 82,680        | 11,534   | 158           | —        | 697             | 95,069   |
| April .....    | 104,902       | 4,638    | 65            | —        | Nil             | 109,605  |
| Total.....     | 292,284       | 25,435   | 1,279         | —        | 2,343           | 321,341  |

**Crow's Nest Pass Coal Company.**—It is estimated that the number of men employed at Michel will reach a thousand, being larger than at any time in its history. The rock for the new coke ovens is being brought from the quarry at the rate of seven cars per day. The company has a large force at work at Morrissey building a trestle to connect with coal bins shortly to be erected. Harry Oldland, of Jefferson, Pa., has the contract for the 250 coke ovens at Morrissey, and has a force at work.



### Stamps and their Increasing Power.

Increased weight, high speed, the judicious use of screens, low discharge, and the narrowing of mortar boxes, are the chief factors that have been instrumental in bringing about the steady rise of stamp duties on the Rand. In 1885 the average rate of crushing was about 4.12 tons per head per day, whilst the figure had increased to 4.86 during last year. This means that 74 tons more were crushed by each stamp in 1902 than by the heads of seven years ago. At the end of last year there were 2,845 stamps at work on these fields. A 1902 head being equal in crushing capacity to 1.17 1895 stamps, it follows that these 2,845 stamps at work last year were equivalent to 3,328 stamps of seven years ago. By extending this comparison it will be seen that 2,845 heads crushing an extra 74 tons per day means some 2,105 tons per day more than 1895. Valuing each ton at about 42s., it means an additional value of gold won to the extent of £4,420 per day, or about one and a-half million sterling per year. These figures speak for themselves. They indicate the Witwatersrand policy of extracting the largest amount of gold in the shortest time practicable. To meet the increased capacity of our mills other machinery has increased in efficiency in direct ratio. In 1895 the only 1,250 lbs. stamp battery was the Modderfontein 40 heads, which was then probably the heaviest on record in a Californian mill. The average weight of the stamps in use on the Witwatersrand Gold fields during 1894 was 850 lbs., whilst the Government Mining Engineer's report for last year shows that there were five 560 lbs. heads, two hundred and forty of 750 lbs., ten of 800, sixty-five of 850 lbs., three hundred and thirty of 950, one hundred and ninety of 1,000, one thousand eight hundred and ninety of 1,050, five hundred and eighty-five of 1,100, one thousand one hundred and seventy of 1,150, three hundred and sixty of 1,200, and one thousand nine hundred and ten of 1,250 on the Rand. For 1898 the duty per stamp was 4.561, so that an increase of .251 tons per 24 hours is recorded since the resumption of milling. Of recent years weight has been added to all parts of the stamps, except perhaps the tappets, the weights of which have remained practically constant. Stems have been increased from 3 and  $3\frac{1}{4}$  inches to  $3\frac{1}{2}$  and  $3\frac{3}{8}$ , and are frequently 15 to 16 feet long. The weight and size of heads, shoes and dies has been varied accordingly, screens have been more thoroughly considered in connection with the fineness of ore crushed, and improvements have been adopted in mortar boxes. There is, however, as yet plenty of scope for improvements which will be instrumental in raising the efficiency. Several of the Witwatersrand mines are recording high standards of efficiency in their batteries, and it seems that a six ton duty will be recorded at no distant date.

The following figures show that several mines are approaching this figure:—Rose Deep (March) 5.96; Crown Deep (March) 5.77; Lancaster West 5.75 (March) and 5.93 (April). During April the average mill duty for the forty-seven mines working was 4.90 tons per 24 hours.

### Mining in British Columbia.

Since our last REVIEW the annual report of the Minister of Mines for British Columbia has been received. The report, which covers the year ended 31st December last, is much on the same lines as its predecessors, and, if somewhat dilatory in publication, presents in handy form considerable information concerning the work done in the various districts and mining camps of that province. Mr. W. F. Robertson, the Provincial Mineralogist, summarises the year's progress as follows:—

The progress made by the mining industry of the province has, during the year 1902, been less marked than usual. If the statistics

of production alone are considered, it would appear that no advance has been made, as the gross value of the mineral production for 1902 is less than that of the preceeding year, the first time that such a thing has happened since lode mining became an industry of the province. While it is necessary to face this fact, it is also necessary to learn to what cause the fact is attributable, whether such causes are permanent or temporary, and whether they are removable or not. The diminished production is not due to any failure in the mines themselves, for no wide-spread failure has occurred, and, as a matter of fact, the mines are in a better condition than they were a year ago. The adverse conditions affecting the output appear to have been different in the various branches of the industry, but, as is the way with misfortunes, they came not singly.

The placer mines showed in 1902 an increased production over the previous year of about  $10\frac{1}{2}$  per cent. This is an exceedingly good showing, but is not nearly as good as it would have been had not the rainfall for the year been exceptionally light, causing a shortage of water supply, which sadly diminished the output of the hydraulic mining companies. This shortage of water is, however, only a temporary trouble, and should disappear with another year.

In the coal mining branch of the industry, the Coast collieries have had their principal market, California, invaded by fuel oil produced in that State itself, and yet, although this competition has come upon them suddenly, they have been able to dispose of within 8 per cent as much coal as last year, and a greater amount than in any year previous to 1901. The Crow's Nest collieries had an unlimited market open to them, but were met with, first, an explosion which crippled their principal mine, followed by strikes which diminished the output, causing the production for the year to be only about half what it should have been, and undoubtedly will be next year. Despite all this, the coal industry about holds its own, but, like the "placer," did not make that advance which the conditions of the mines and market would have justified.

The lode mining of the province has been the branch most sorely beset, and this not owing to any failure of the mines themselves, but to the unprecedentedly low market price of metals which has prevailed during the entire year, beginning, as it did, in the last month of 1901, while it is only in the early months of 1903 that the market has begun to recover. To realize what this drop in the market really was, it is necessary to make a direct comparison, as follows:—

Taking the average value for the whole of each year of the various metals, as quoted on the New York Metal Exchange, we find:—

|                   | 1901  | 1902                              |  |
|-------------------|-------|-----------------------------------|--|
| Copper.....       | 16.11 | 11.62, a decreased value of 27.3% |  |
| Silver.....       | 58.95 | 52.16, " " 11.5%                  |  |
| Lead (in bond)... | 2.165 | 1.94, " " 10.4%                   |  |

Now these decreased percentages of market value represent just such a depreciation, as compared with the previous year, in the gross value of the mineral produced, namely, in the gross revenue of the mine, and such depreciation has in many cases wiped away, temporarily, any profit that there may have been in the enterprise. For example, a copper ore marketed in 1901 would have earned a net profit of 27.3 per cent. above all working expenses; if sold in 1902 it would have made no profit, merely paid expenses. With profits so diminished, the mine owner produced and sold as little ore as he could afford to, confining his efforts to development, and leaving his ore in the ground until such time as the market should improve, as it was bound to do soon; in fact, at the present writing, the rise in the market price is marked. This drop in the market values of the metals has had a double effect on the statistics, inasmuch as it has reduced the value of such ores as were mined and has constrained the miner to restrict his output. The actual statistics of the mineral production



are fully set out in tabular form in the preceding pages, but it may be advisable to briefly explain what these tables show.

Table I. summarises the total mineral production of the province up to the end of 1902, and shows what amounts of this total are to be credited to the various mineral products. The wealth thus created by the mineral industry amounts to the grand total of \$189,728,538, of which some \$86,677,415 was derived from gold—the chief product of the province—and \$58,989,572 from coal and coke, with silver and copper following next in order of importance.

Table II. shows the amount which has been contributed each year to the making up of the grand total, and illustrates the growth of the mining industry as far as statistics can. The percentage increases for each year over the preceding year have been—starting with 1896—33 per cent., 39 per cent., 4.33 per cent., 13.66 per cent., 31.8 per cent., and in 1901 23 per cent. For 1902 we have for the first time to record a decrease in value, and happily not a very great one, amounting to \$2,600,000 as compared with 1901. This decrease is largely due to the lower market values of the various metals, as will be seen by referring to Table III., in which if we were to credit this year's output at the prices prevailing in 1901, the decrease would nearly disappear, being only \$565,742.

Table III. gives in detail the amount and value of the various mineral products for the last three years. As compared with the previous year, the production of 1902 shows, as to market values, for—

|                              |                |      |           |
|------------------------------|----------------|------|-----------|
| Placer gold.....             | an increase of | 19.4 | per cent. |
| Lode gold.....               | "              | 12.4 | "         |
| Silver.....                  | a decrease of  | 32.7 | "         |
| Copper.....                  | "              | 25.0 | "         |
| Lead.....                    | "              | 58.8 | "         |
| Coal.....                    | "              | 4.3  | "         |
| Coke.....                    | an increase of | 0.71 | "         |
| Other metals and materials.. | "              | 15.0 | "         |

It is to be noted that the copper products shows a decrease as to value on account of the low market price of the metal ruling during the year, but that, as regards the quantity of fine copper produced, the year 1902 really shows an increase of 7.4 per cent. over the previous year.

Table IV. shows the gross value of the mineral production of the various mining divisions and districts for the past three years, and illustrates the growth of productive mining in the various parts of the province. It is especially interesting to note how the output of the placer districts varies from year to year (caused by the weather), and how quickly the Boundary district has risen to prime importance.

Table V. shows the amount of placer gold that has been produced each year since its first discovery in British Columbia, in 1858, to date. The sum total of gold so produced amounts to \$64,627,683.

Table VI. shows the yearly of the lode mines of the province since 1858. Lode mining or "quartz mining," as it is commonly called, has not made as good a showing as was anticipated during the first part of the year, a fact which must be admitted, although the reasons already given may be sufficient explanation. The drop in the price of metals has been already referred to, while the position of silver-lead producers will be spoken of in more detail later. The tonnage of ore mined in the province has been greater, amounting this year to 998,999 tons, as against 920,416 mined in 1901, an increase of 8.6 per cent.

This great increase is entirely due to Rossland and the Boundary, more particularly the latter, in which district 521,402 tons of ore were mined and smelted.

The following table shows the number of mines in each district that shipped ore during the year 1902, with the number of men employed:—

Table Showing Distribution of Shipping Mines in 1902.

|                                             | No. of Mines Shipped over 100 Tons in 1902 | No. of Mines Shipping | Men Employed in these Mines |       |       |
|---------------------------------------------|--------------------------------------------|-----------------------|-----------------------------|-------|-------|
|                                             |                                            |                       | Below                       | Above | Total |
| Cariboo .....                               | 1                                          | ....                  | 3                           | 2     | 5     |
| Cassiar:                                    |                                            |                       |                             |       |       |
| Skeena .....                                | 1                                          | 1                     | 8                           | 10    | 18    |
| East Kootenay:                              |                                            |                       |                             |       |       |
| Fort Steele .....                           | 1                                          | 1                     | 30                          | 17    | 47    |
| Other Divisions .....                       | 4                                          | 1                     | 23                          | 8     | 31    |
| West Kootenay:                              |                                            |                       |                             |       |       |
| Ainsworth .....                             | 12                                         | 5                     | 75                          | 44    | 119   |
| Nelson .....                                | 14                                         | 10                    | 246                         | 170   | 416   |
| Slocan .....                                | 40                                         | 25                    | 476                         | 161   | 637   |
| Trail .....                                 | 10                                         | 8                     | 710                         | 281   | 991   |
| Others .....                                | 9                                          | 2                     | 80                          | 39    | 119   |
| Lilloet .....                               | 4                                          | 1                     | 12                          | 17    | 29    |
| Yale:                                       |                                            |                       |                             |       |       |
| Grand Forks, Kettle River and Osoyoos ..... | 18                                         | 13                    | 373                         | 234   | 607   |
| Yale, Ashcroft, Kamloops .....              | 2                                          | 1                     | 24                          | 11    | 35    |
| Coast .....                                 | 8                                          | 7                     | 159                         | 132   | 291   |
| Total .....                                 | 124                                        | 75                    | 2219                        | 1126  | 3345  |

It will be seen from this that the number of mines shipping over 100 tons is 3 less than in 1901. Of the non-shipping mines the statistics are very incomplete, as few of them report to the Department and most have no representatives who can be found to give details as to the number of men employed, etc. Returns have, however, been secured from 44 non-shipping mines, and these employed a total of 342 men; 158 above ground and 184 below ground.

#### COAL.

The coal mining industry has held its own during the year 1902. There is not an increase in production over 1901, but there is no appreciable decrease, and, considering the difficulties with which this industry has had to contend during the past year, this may be considered an extremely good showing. The gross output of coal for the the year 1902 was 1,641,626 tons, of which 244,232 tons were converted into coke, leaving a net output of 1,397,394 tons of coal and 128,015 tons of coke. This represents a slight decrease in the coal output and a slight increase in the coke production, as compared with the year 1901, the loss on the one hand just balancing the gain on the other. Of this net output Vancouver Island collieries produced 1,173,893 tons of coal and 20,178 tons of coke, a decrease of 87,851 tons of coal and an increase of 4,780 tons in coke. When it is considered that fully 75 per cent. of the output of the Coast collieries was exported to California, and that this last year has seen the introduction in that State of petroleum fuel to so great an extent, it is remarkable that the falling off in this market should only have diminished the coal output of Vancouver Island some 8 per cent. The increase of 30 per cent. in the coke output of the Coast has only partly been occasioned by the starting of two smelters on Vancouver Island, as it will be seen by a subsequent table that the greater proportion of the coke produced from the Island collieries was exported. As has been noted before, the output of the Coast collieries is limited only by the market, while with the Crow's Nest Pass collieries the market is in advance of the facilities of output and transportation.

The Crow's Nest Pass collieries produced in 1902 some 223,501 tons of coal for use as such, and manufactured, from an additional 170,460 tons of coal, 107,837 tons of coke, being a slight increase over last year as to net coal output, and a slight decrease as to coke production. These collieries have been exceedingly unfortunate during the past year, as in the month of May, just as the rush of spring shipments was on, a serious accident occurred at the principal mine,



the Coal Creek colliery, which has been practically unproductive since, pending repairs and alterations in connection therewith. Following this, there have been one or two "strikes," which have greatly reduced the production of all the three mines operated by the Crow's Nest Pass Coal Company. The company's plant at the Morrissey colliery, which will in all probability be the greatest producer of these mines, was only completed lately, and the output during the year 1902 was small. There is but little doubt that if the company had had a year of uninterrupted work the output would have been at least doubled.

Shortages of both coal and coke have occurred during the past year at the smelters and mines supplied by the Crow's Nest Pass Coal Company, and so frequent have these shortages been as to seriously interfere with the running of the smelters, and, consequently, of the mines. Sales of coal were as follows:—

|                                     | Tons Coast. | Tons Crow's Nest. | Tons Total Prov. |
|-------------------------------------|-------------|-------------------|------------------|
| Sold for consumption in Canada..... | 310,765     | 111,701           | 422,466          |
| " export to U.S. ....               | 673,524     | 101,776           | 775,300          |
| " " other countries.....            | 1,508       |                   | 1,508            |

The sales of coke were:—

|                                     | Tons Coast. | Tons Crow's Nest. | Tons Total Prov. |
|-------------------------------------|-------------|-------------------|------------------|
| Sold for consumption in Canada..... | 3,998       | 81,073            | 85,071           |
| " export to U.S. ....               | 12,016      | 26,764            | 38,780           |
| " " other countries.....            |             |                   |                  |

The additional transportation facilities provided by the completion of the Great Northern Railway into Morrissey, giving direct communication with the United States, coupled with the fact that the import duty into the United States of 67c. per ton has been removed, would seem to guarantee a very much increased output for the coming year.

#### GOLD.

The total or combined placer and lode gold output has this year, as usual, maintained an increase, having reached the total value of \$5,961,409, the highest gold output ever made by this province, being an increase over 1901 of \$642,706 or about 12 per cent. This increase has been shared in equally by the placer and the lode gold mines of the province.

The placer gold output for 1902 was \$1,073,140, an increase of \$103,040 over the preceding year. It is to the small partnerships and individual miners that is due, not only the present increase, but the prevention of what promised to be a serious deficit, inasmuch as the large companies have this year made comparatively poor outputs, for reasons explained later. As an illustration of this fact, the Gold Commissioner of Atlin reports that out of a total sum on which royalty was collected of \$261,985, some \$190,652 was produced by the small or individual concerns, and only some \$71,162 was produced by the larger companies. This statement is even stronger than appears on the face of it, inasmuch as it is far easier to collect royalty from companies, and it is highly probable that as much as \$100,000 produced by individuals escaped taxation.

This is also equally true of the Cariboo District, for in the Omineca Division only small concerns were at work this past year of 1902, yet the output of gold was about double that of 1901. In the Cariboo Division there were produced some \$60,000 over the previous year, and this amount is certainly due to the small concerns as the big companies made little production during 1902. There are in this division, however, a number of small companies or partnerships, the

efforts of which have been very successful during the past year. In the Quesnel Division, in which the yearly output is chiefly made up from the product of one or two large companies, there has been this year a decrease of about \$80,000, due to the falling off in production of these companies, while the product of the individual miner remains about constant.

As to the placer gold output of the remainder of the province, it is almost exclusively produced by partnerships or individuals.

#### HYDRAULICING.

The past year has not been a successful one for the hydraulic miner, from causes entirely beyond the control of man. For instance, the largest hydraulic company in the province, the Consolidated Cariboo, this past year had only water sufficient to run 66 days and to move 690,442 cubic yards of earth, producing \$61,395 in gold; while the previous year there was water for 104 days, and 2,420,288 cubic yards were moved, producing \$142,274 in gold. The watershed from which this water was collected was the same as in the previous year, and it is simply a case of insufficient rainfall. The rainfall for some three or four years past has been getting less each year, although it must be pointed out that this state of affairs is not expected to continue, for it seems that such occurrences run in cycles, and that a period of greater rainfall is now almost due. The output, then, of such a company as this, with a given plant, seems to be very nearly in direct proportion to the precipitation of the watershed.

In the Atlin District, the report of the Gold Commissioner as to gold produced indicates that the hydraulic companies have not yet really settled down to business, and the hope entertained of a large output from this quarter is again deferred for another year. The Thibert Creek Company's property in the Liard Mining Division gave promise this year of being a considerable producer, but this hope was frustrated by a tremendous clay slide, which practically buried the pit. This slide has now been removed, and the gold should be recovered next year.

The auriferous black sands found on the Coast at various points have not been productive this year, for reasons unknown.

#### DREDGING.

Dredging for gold has not received the usual amount of attention this past year, only two or three dredges having been at work. On the Quesnel a prospecting dredge was operated for a portion of the year with good results, but made only a small output. Another dredge is reported to have been prospecting on the Thompson river, with what results has not been learned. At Lytton, the old Cobeldick dredge has been working. Here Mr. Turner, the director who was sent out from England to investigate for the company the working of the dredge, made the discovery that, of the gold dredged up from the bottom, less than 10 per cent. was recovered on the tables, the remaining 90 per cent. going off again with the tailings, although the gold-saving appliances on this machine were about the most complete of any in British Columbia. It certainly appears as though here is the point of failure in most of the dredging operations in British Columbia, and the realisation of this fact should soon lead to the removal of the difficulty, when, only, will this industry become the success which the conditions seem to warrant.

#### LODE GOLD MINING.

Lode gold mining has this year made a production of \$4,888,269, being an increase of \$539,666 over the previous year, or about 12½ per cent. This increase is attributable to the greatly increased tonnage of the mines of Trail Creek and the Boundary. The increased tonnage has brought with it lower values per ton of ore mined, but this has been more than compensated for by the cheaper smelting. mining and transportation rates thus rendered possible. Gold is the only



metal which may hope to escape the fluctuations of the market, and it is the gold contents of the ore that has enabled most of our copper mines to continue production in the face of a 27 per cent. drop in the price of the latter metal.

The product of lode gold mining in British Columbia has shown the steadiest and most regular increase, and this product is the most valuable which the province has. It can, however, not be classed as even a separate branch of the industry of mining, inasmuch as the gold is mostly found in combination with other metals, such as copper or silver. A certain amount of this production is derived from stamp-milling, etc., but chiefly it is due to smelting.

The following shows approximately that the gold has been derived from:—

|                                              |           |
|----------------------------------------------|-----------|
| Direct smelting of copper-gold ores .....    | 4,232,948 |
| Combined amalgamation and concentration..... | 655,321   |
| Total.....                                   | 4,888,269 |

#### SILVER AND LEAD.

The total amount of silver produced by the province in 1902 was 3,917,917 ounces, valued at \$1,941,328, a decrease as compared with the output of 1901, but practically the same as that of 1900. Of this total amount about 25 per cent. was mined in association with copper, while the remaining 75 per cent. was mainly derived from the silver-lead ores of the Slocan District and of East Kootenay. Included with the Slocan ores are the "dry ores" from the Slocan city division, which, while as yet forming a small proportionate part of the output of the district, are still ever increasing in volume and importance. Their importance consists in supplying to our local lead smelters an ore with which can be utilized the galena ores which are so plentiful in British Columbia, thus rendering the smelters the better able to meet foreign competition. The decrease in the silver production has been entirely confined to the silver-lead ores, and the drop in the output of this class of ore has been very great. In the Slocan the tonnage has decreased by 4,340 tons, with 1,000 tons further decrease in the Ainsworth Mining Division. It will be noted that the ore shipped from the Slocan Mining Division this past year is higher grade than in 1901, implying that the mines which have diminished shipments are the low grade properties. In the Fort Steel Mining Division, which for the last two years has been the heaviest producer of galena ore, this condition of low silver tenure is most extreme, since the silver occurs only to the extent of  $\frac{1}{3}$  to  $\frac{1}{2}$  ounce to the per cent. of lead. Here the mining of galena has been practically suspended, since the output of 1902 was only 3,600 tons as compared with 63,000 tons of the year previous (1901), and 87,000 tons in 1900. This is not due to the mines nor to local conditions, but is entirely owing to the condition of the market for such lead ores low in silver.

What relief may be had from this condition is very much a question, and even among the lead mine owners there is a wide difference of opinion on the subject. To the writer it seems that relief from that condition will come permanently only with the establishment and operation of smelters near the mines, at a central point, together with a customs refinery, in which the silver may be separated from the lead and shipped quickly to market, while the lead, which forms only about 30 per cent. of the value, but 99 per cent. of the weight of the crude bullion, finds its way by the cheapest, though slowest, freight to the most available market, which will probably prove to be the Trans-Pacific and which yet requires to be developed.

The lead production of the province in 1902 was 22,536,381 lbs., only about half of that of last year, owing to the suspension of the East Kootenay lead mines, but greater, nevertheless, than the production of 1899.

#### COPPER.

It was remarked last year that the particular feature of interest in 1901 was the great increase in the copper production of the province, and it might be said that the same feature remains of prime interest this year, or, perhaps, the feature of interest might be more correctly stated as the increased and increasing tonnage of copper ores, of extremely low grade, which are being treated with apparently a profit, at the various Boundary smelters. The interest which is being taken in the successful working of these ores, is more than local, and is causing much attention to be turned to other bodies of ore so low grade as to have been considered valueless. The output of copper for this year was 29,636,057 lbs., an increase of 2,032,311 lbs., or 7.4 per cent. over the preceding year, but owing to the drop in the market price of the metal, the value of the year's output was \$1,000,290 less than was that of 1901. The Boundary still yields the greater part of the copper production, with an output of over half a million tons of ore, while Rossland makes the next largest output. The following shows the districts from which the copper output has been obtained this year:

|                       |                 |
|-----------------------|-----------------|
| Boundary .....        | 14,955,582 lbs. |
| Rossland.....         | 11,667,807 "    |
| Coast .....           | 2,496,681 "     |
| Nelson.....           | 491,144 "       |
| Other Districts ..... | 24,843 "        |
| Total.....            | 29,636,057 "    |

#### IRON ORE.

A good deal of iron ore has been mined on the coast during the past year, but the only shipments made have been from Texada Island, from which some 6,290 tons of magnetic iron ore, running over 50 per cent. iron, were sent to the iron furnace at Irondale, Washington. From the iron mines at Cherry Creek, near Kamloops, some 3,727 tons of magnetite were shipped to Nelson, for use there in the smelter as a flux.

#### OTHER MINERALS.

There was some \$190 worth of platinum produced from the Similkameen District this past year. This is the only locality where the metal is saved. The black sands of the Quesnel River, Cariboo District, have been proved to contain considerable quantities of both platinum and osmiridium. Analysis of these sands will be found in the report on the Cariboo District, but so far little attention has been given to the saving of these metals, which are not retained by the ordinary riffled sluice but require under-currents or some similar appliance.

This department has recently received samples taken from a tunnel of a mine in the Cariboo District, and on examination these samples were found to contain tin in very distinct metallic particles. The rare occurrence of tin in the metallic state is recognized, and, while no doubt is felt as to the good faith of the sender of the sample, the discovery will require to be further investigated.

#### BUILDING MATERIALS.

Of building materials, under which designation are included stone, brick, lime, cement, together with fire clay, fire brick, drain pipe, etc., there are no returns available, and the amount credited to these materials has to be estimated. This has been done as carefully as possible. There are local lime quarries and kilns in almost all parts of the province, while on the coast there are a couple of companies making a most exceptionally pure lime from crystalline marble, and this has a considerable foreign sale. Clay for red brick is found everywhere, and local yards supply the local demand. The granite and sandstone quarries situated on the islands of the coast are splendidly located as regards transportation by water. Fire clay, bricks, drain pipe and tiles are manufactured on Vancouver Island and find a ready local market in the province.



## GENERAL DEVELOPMENT OF THE YEAR.

The following is only a general review of the development of the year, the details of the work done in each district being found in the body of the report under the proper heading:—

In the Atlin District the past season has been very satisfactory, inasmuch as it has been demonstrated that the life of the camp is not to be measured by the life of the placers in the creek bottoms. The higher run of gold, noted in the report for 1900 as occurring under the benches in the triangle between Pine and Spruce Creeks, has, after thorough prospecting, been opened up by tunnels and shafts, and a number of claims have been worked as drifting propositions pretty well throughout the length of Pine Creek above Stephendike, including many of its tributaries, and also on Spruce Creek. Between 600 and 700 men have been engaged in mining during the summer and about half that number will be engaged during the winter on Pine, Gold Run, Otter, Spruce and Boulder Creeks. In certain places where the topography admitted of it, the high channel has been attacked by hydraulic methods, with very satisfactory results.

In the Bennett Division there are no placer claims, and little progress has been made on the mineral locations, with the exception of those on the Big Horn River.

The placer mines of the Chilkat District have failed to produce satisfactory results. The mineral claims of Rainy Hollow are still being prospected, but are of too low a grade to admit of being worked at such a distance from transportation.

Of the Teslin Lake Division there is nothing special to note; prospecting is being done in the division with occasional reported finds which seem most promising, but work has not proceeded sufficiently far to tell what the properties may be worth.

In the Stikine Division there are no new developments. A find of coal is reported on Lake Tahltan, and samples of the same, which have been received by this department, indicate it to be a good lignite but not a bituminous coal.

In the Liard Division there has been some activity in the neighborhood of Thibert Creek, where two or three companies are at work, but only one of these is sufficiently far advanced to be expected to produce as yet, and this company has suffered from a clay-slide which filled the hydraulic pit last summer, doing however, no very serious damage further than wasting the season.

In the Skeena Division there has been very active prospecting going on.

On Observatory Inlet and on the northern portion of the Portland Canal several properties have been worked, with considerable promise of ultimate success.

On Princess Royal Island certain properties have been developed and have made shipments of ore which have given surprisingly high assay returns.

Of the claims on and near Bornite mountain, on the Skeena River, very little news has been received this year.

On Queen Charlotte Islands, the coal fields, long known to exist have been receiving some attention, while in the southern islands of the group information has been obtained that very promising discoveries of bornite copper ore have been made, which received some development during the past season and will be thoroughly investigated this coming year.

No new development has occurred in the New Westminster Division. The Howe Sound copper properties have remained dormant, the low price of the metal not being a stimulant to new copper enterprises.

The copper properties on Texada Island have been doing well; the Marble Bay has shipped regularly and still has a good showing of

ore in the bottom levels. The Copper Queen, Cornell, Loyal, etc., which had suspended shipments, were taken up under bond by Mr. Vaughan-Rhys, who, after much work, has been fortunate in proving up extensions of the old ore-bodies with depth, and has also been fortunate in finding exceptionally good gold values in a quartz vein just behind the Cornell engine house.

The Mt. Sicker camp has done little actual producing this past year, as each of the two important properties on this hill, the Lenora and Tyee, has been awaiting the completion of a smelter to treat its ores, and so has confined its efforts to development. As soon as the Crofton smelter was ready to take the Lenora ores, that mine got into financial troubles, since which no mining has gone on, and the Tyee smelter did not make returns until January of 1903, so that the results do not appear in 1902.

On the Alberni Canal the two copper properties have lain dormant since the drop in the value of copper, and it is not likely that shipments will be resumed until this metal has reached a higher price. As these properties carry little or no precious metals in connection with the copper, the ores feel the fluctuations of the copper market more severely.

The iron mines on Barkley Sound have received considerable development, but as yet no shipments of ore have been made.

On the West Coast of Vancouver Island certain copper properties on Quatsino Sound have been opened up, equipped with suitable shipping facilities, and have begun making shipments of copper ore to a local smelter. Several other properties in this district have been under development, and it is reported that the results obtained have been very satisfactory.

In the Fort Steele Mining Division the most important mining operations are, of course, those of the Crow's Nest Pass collieries. These collieries have held their own this past year, and but for a serious explosion and several strikes would have undoubtedly doubled their output.

As was noted last year, the condition of the lead ore market was such as to render the mining of lead ores, low in silver, of little or no profit. These conditions have prevailed to such an extent as to practically shut up every galena property in this division. The Trail Lead Refinery has been a success on a small scale, but has not yet come to the assistance of ores of the lower grades. The question of relief from the conditions has been laid before the Dominion Government, which has the matter now under advisement. The Slocan has suffered similarly, owing to the conditions of the lead ore market, but to a less extent, as the silver contents of the ore is higher. The development of "dry ores" in this district is distinctly promising.

In the Nelson Division the mines in the neighborhood of Ymir have maintained their usual output. The Yellowstone has been practically shut down, but a couple of new mines have been opened up in its place.

The Silver King (Hall Mines) was shut down by the company, but has been taken under lease by the former superintendent, Mr. Davys, who seems to have been fortunate in finding further ore-bodies.

In the Trail Mining Division (Rossland) there were this year two less mines shipping than in 1901, but the output has increased from 283,360 tons to 329,534, an increase of 46,174 tons. This advance has been obtained chiefly through the increased shipments of the Le Roi and Le Roi No. 2. The Centre Star and War Eagle Mines only worked about three or four months out of the year, having been practically closed down the rest of the time for some reason. The average grade of the ore of the camp has been maintained throughout the year. The return this year indicate the same gold assay, a reduced



silver assay (which was never very important), and a slightly higher copper assay than last year.

The Boundary District has again this year been the centre of general interest. The immense size of the ore-bodies of the district has been recognized, and it has also been admitted that they are all exceedingly low grade, so much so that it has been a serious question whether they could be worked to a profit.

That this problem has been solved is indicated by the immense smelting plants of the Granby B. C. Copper (Mother Lode) and Montreal and Boston Companies, where the tonnage of ore treated has been so great as to reduce the costs of mining, smelting and marketing to a minimum. The very drop in the price of copper was met by an enlargement of the plants, and in one case a Bessemer converter plant was erected to treat the matter produced in the district.

These companies all claim that they are, and appear to be, making both ends meet on 11.6c. copper. Should the metal rise 3c. per lb., which it probably will, it would mean an additional earning to these companies of over half a million dollars a year. The state of the Boundary District does not differ from that described last year in these pages, but the condition of affairs has been prolonged and emphasized.

In the Similkameen prospecting has continued to be followed with success, but productive mining in that section will not be in advance of railway transportation.

#### Nova Scotia Collieries Limited.

This company has been formed to acquire certain mining leases conferring the right to win coal under areas covering twenty-six square miles in the County of Inverness, Cape Breton, Nova Scotia. The land is alleged to contain "many millions of tons of coal," and the original vendor and another are reported to have offered by cable, to enter into a contract to take 200,000 tons of the company's coal annually for ten years, at prices which it is assumed would yield the company a profit of £30,000 per annum. We do not know what this reported offer may be worth, but from an examination of the contracts, We venture to think that it would not be much. Mr. Ira Taylor, of New York, (the original vendor), is selling the land to the promoting syndicate (the B.D.L. Syndicate, of Star Chambers, Moorgate Street, E.C.), for £90,000, which would be a ridiculously low price if he were in a position to place coal contracts with this company which would produce to it £30,000 in profits annually. Then the B. D. L. Syndicate is transferring the undertaking to the company for £142,500 "wholly or partly in cash, at the option of the directors." Thus they have arranged to make a profit of over £50,000 on the transaction, the company being saddled with the preliminary expenses. But they are not content with this. They are going to take another £10,000 (partly in cash and partly in shares) for guaranteeing to obtain subscriptions for 50,000 preference shares (the minimum subscription on which it is proposed to go to allotment). That is to say, they have arranged to pocket £1 for every £5 received on these preference shares. The whole scheme is undoubtedly an excellent arrangement for the intermediaries, but it is one which is calculated to turn out disastrously for the members of the investing public who may be foolish enough to subscribe to it.

#### Mine Development Methods.

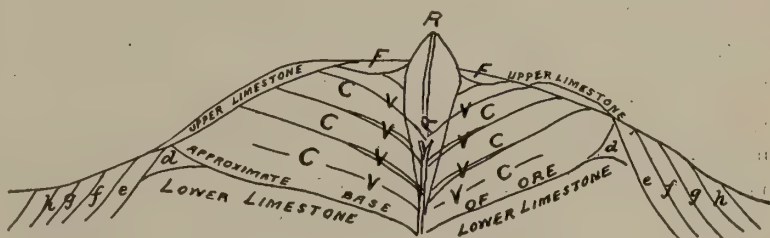
By B. J. FORREST, C. & M. E., Broad Cove, C.B.

**Prospecting.**—In coal formations have found outcrop indications first to prove. Secondly, drifting from outcrop if this exists; if not, thirdly, boring to or through the carboniferous measures and locating

and finding dip, strike and contour, and number of seams, and if possible direction and throw (up or down) of faults, with a view of sinking to and opening out from dip side of measures or faults, and reducing future cost of development and working, such as getting and haulage of coal, pumping of water, intersection of faults, etc.

In iron formation, when stratified, similar methods will obtain, and in more stratified formations, survey with dip-needle, plane-table, aneroid (and cacheometer, if necessary), to locate strike and dip and contour; then area and thickness, by drifting, blocking and drilling. Drifting, the generally more expensive, I have generally found more trustworthy as regards testing of capacity and areas of deposits; drilling, though cheaper, is not so reliable or certain of satisfactorily proving iron formations or deposits, such as are commonly met with in Ontario and Nova Scotia, e.g., magnetite interbedded with green schists, diorites and felsites, titaniferous magnetites mixed with eruptive rocks and conglomerates.

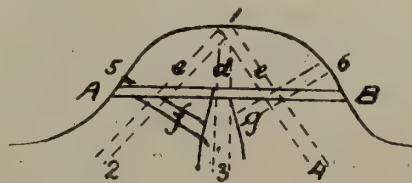
The upper and lower Cambrian measures, so far as I have been able to observe, appear to have the largest and most easily workable or conveniently placed bodies of ore for economical working or development; the ore-bodies or deposits occurring in post-glacial formations in Ontario appear to be more irregular than those in the Cambrian measures, though this supposition requires further investigation as there appears to exist some intermediate iron formations between the Huronian and Cambrian series. The Bilbao iron ore formations in north of



SKETCH OF BILBAO, TRIANO, IRON ORE FORMATION.

**Observations.**—R. Rubio ore, cindery honeycombed appearance, containing about 56 per cent. metallic iron, with a large quantity of fireclay and silicious earths mixed with it. V. Vena, or soft vein of ore, running through centre of ore bodies, very rich soft ore averaging 65 per cent. of metallic iron. C. Campanil, or main body of ore, good hard hematite, about 60 per cent. metallic iron; these ores average about 0.02 to 0.08 phosphorous and from 2 per cent. to 8 per cent. silica. d. Siderites, in pockets and layers. e, f, g, h. Schistous grits, siderite, limestone and sandstone. F. Fireclay.

Spain (of hydro-thermal origin) are found associated with upper and lower cretaceous formations and deposits of limestone, clay and sandstone conglomerates—the Triano or central formation having approximately the following transverse contour (see sketch). In prospecting with drills the probabilities of intersection in a pockety or irregular bedded formation of iron ore vary considerably with class of deposit, lode, bed or spur, i.e., the chances of satisfactorily proving extent area or capacity of irregularly stratified deposits vary more or less, as follows, e. g., see sketch:—



1 to 2 drill holes through lode or seam c.—Vertical holes, depth 40% to 100%.  
1 to 3 " " " d.— " thickness 0% to 50%.  
1 to 4 " " " e.— " At angle of 45° (right and left)—depth and  
5 to 3 " " " f.— " thickness from 20% to 30%, or the mean  
6 to 3 " " " g.— " average of chances of proving lodes by  
A, B—Drift. [drill would be from 40% to 60% of actual areas.  
By drift A, B—thickness 100%, depth 0% to 100%. By drift at angle of 45° =  
40% to 100%, and proportional to depth below summit and level of line A, B.

The advantage of drifting in like deposits is that not only can strike, dip and capacity be proved, but class and extent of bed and hanging rock and adjacent strata—sampling, water-feed, etc. The



percentage of extent or capacity proved would also depend on amount or extension of cross and vertical drifting, drilling, sinking and blocking carried out from said level, a considerable extent of which might be proved by drilling of breast and flank holes from said levels.

*Comparisons of Cost of Proving and Testing Deposits.*—This would depend greatly on class of formation, extent of blocking, drifting and drilling carried out. The ratios of cost would vary—e.g., drilling by diamond drill from \$5 to \$8 per lineal foot, increasing with length, depth and size of hole.

*Shafts.*—Would also vary with depth and area from \$6 to \$10 per lineal foot, increasing with depth, amount of water struck, and cost of winding, haulage and ventilation.

*Drifting and Blocking.*—From \$6 to \$9 per lineal foot, increasing with area, amount of propping or steining, distance and dip from shaft or main drift, length and angle of haulage, winding, ventilation, and water struck. Cross drifting and blocking from main shaft or level would cost from 15 per cent. to 20 per cent. more under similar conditions.

I have generally found drill work more satisfactory or suitable in testing of coal areas or similar formations, but not so effective in proving irregular lodes or deposits, except in those more extensive and regularly stratified, such as found in Newfoundland, Spain, Portugal and South America.

*Developing.*—If possible and convenient, and extent of overburden, spurs, faults or stripping too thick or interbedded, open-cast cut or quarrying is preferable to mining, providing lifts and length and depth of working faces and levels are at a convenient and economical working height and distance, in relation to gravity and point of delivery, and the disposition of mining and transporting gangs, plant and machinery, such as air compressors or steam drills, crushers, transporting plant, tracks, chutes, bins, etc., and if conveniently situated and apportioned to area, length and output from working faces or levels, and number of men that can be economically employed on each face or working level and their position with regard to point of delivery, classification of ore, gravity, tracks, etc.

*System of Transport and Haulage.*—If distance short and gravity available, chutes and inclined planes would probably serve the purpose. If distance long and contour of ground regular, endless, or tail-rope, or Lidgerwood cable systems might serve. If distance long and contour of ground irregular or very steep and undulated, wire cable-ways, steam or electric trams or railways would serve better, and if fluvial transport available would be cheapest.

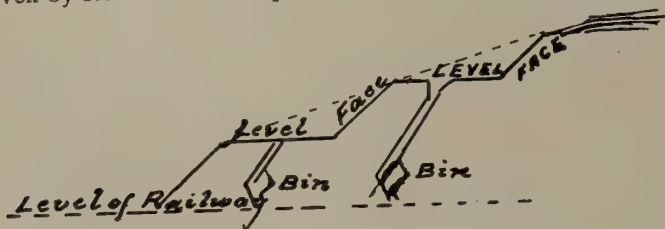
The approximate rates of cost of above named systems would vary more or less as follows, viz.:

*Inclined Plane.*—Transport, from 10 to 16 cents per ton mile. Cost, from \$10,000 to \$15,000 per mile.

*Endless and Tail-rope Systems.*—Transport, from 12 to 17 cents per ton mile. Cost, from \$12,000 to \$15,000 per mile.

*Wire Cable-ways.*—Transport, from 12 to 17 cents per ton mile. Cost, from \$10,000 to \$15,000 per mile.

Varying proportionally with single and double lines, self-acting or if driven by steam or electric power, and contour of ground traversed,

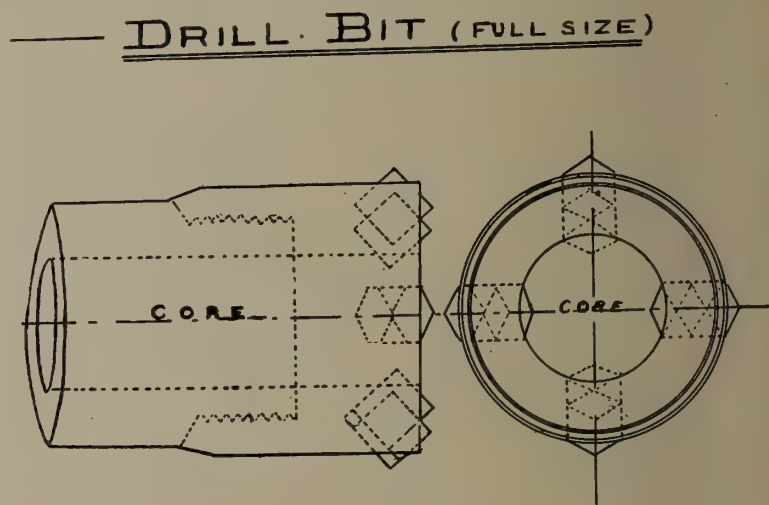


with the advantage that it is easily removed and re-erected if necessary. This system is generally suitable for mines and quarries difficult of

access and working and of doubtful output and capacity. If mines or deposits are proved to be of large capacity and productive, would recommend running railway cars right into and under main working levels and faces, thus reducing cost of handling and transport of ore. If water transport available and point of delivery great, cost would be still less.

*Drilling Plant and Machinery.*—This depends on class and position of ore and work; generally compressed air is preferable to steam or hydraulic power in deep or irregular open-cast or underground work, shafts and drifts, on account of drainage, ventilation and non-formation of water, damp, heat and gases, loosening of cover and swelling of bottom; of top, bottom or side stripping, when sinking, drifting or blocking.

*Class of Drill.*—This depends on class, position and nature of ore and work to be dealt with, and whether under or over ground, vertical or under-cutting or holing work is to be carried out. The diamond drill, if true (not faked) Brazilian carbonates are used and carefully set in suitable bits, and experienced or skilled men employed, is well suited for any class of deep vertical or flank holing in hard irregular formations; though the Calyx drill has done some first-class work in hard rock, and the renewal of bits is not so costly and risky. With a view to reduce cost of replacing diamond drill bits, I have experimented a little with corundum crystals, which are next in hardness to diamonds, (viz.: diamond, 10; corundum crystal, 9). I think a fair percentage of boring done by diamond drill might be done with them; the main points to solve are the size and pitch, and setting and cutting angles, and fixing metal of bit and crystals used. So far, my experiments lay in the following lines (see sketch):—



### Nickel Deposits in New Caledonia.

By MAJOR R. G. LECKIE, Sudbury Ont.

New Caledonia is a large island lying in the Southern Pacific between 20° and 22° south latitude and 161° and 164° east longitude. Its greatest length, 248 miles, runs from northwest to southeast and its width at the narrowest point is a little over 30 miles.

The coast line is very irregular and is protected almost everywhere by a barrier of coral reefs more or less distant from the shore. Frequent openings through these reefs lead to good harbours and safe anchorage for vessels of the largest class.

The interior of the island being mountainous and roads very limited, transportation of goods and passengers is carried on chiefly by small coasting steamers which find comparatively calm water behind the protecting reefs.

No systematic geological survey of the island has yet been made, and in this the Government appears to be unaccountably remiss.



The shipments of ores and minerals constitute fully one half of the total value of the island's exports, hence the development of the mineral industry is of the highest importance.

The gneises and mica schists of the older formation are strongly developed in the northwest and upon these rest the sericite and talc schists and crystalline limestone of the Silurian. The peridotite has overflowed these and in the derivative serpentine the ores of nickel, cobalt and chrome are found.

Dr. T. Sterry Hunt in describing the Canadian serpentines says: (Report Geological Survey of Canada, 1863, page 472) "The serpentines of the altered Silurian rocks in Eastern Canada, often form vast masses, almost without admixture. The almost constant presence of small portions of oxyd of chrome and nickel is to be remarked in the analyses, not only of these serpentines, but of the other magnesian rocks of the region." This description will also apply to the serpentines of New Caledonia, although they are more highly impregnated with these metallic oxides, than those of Canada, and both are characterized by the constant presence of grains of magnetic iron.

Olivine appears to be constantly associated with these ores in New Caledonia, Canada and Oregon. But it also accompanies the nickeliferous iron of meteorites. Nordenskiöld gives the analysis of a meteorite now in the Stockholm museum which contains 40.98 olivine. It was also determined in two meteorites which fell in Brazil as well as in that which fell in Kansas in 1890.

Mr. F. Danvers Powers notes the presence of nickel in the olivine associated with the new Caledonia serpentines; "Certainly the nickel seems to favour the olivine, and that mineral on account of its numerous cleavage faces, is susceptible of attack." Dr. Sterry Hunt likewise remarks; "The olivine from this locality, like the accompanying magnesian minerals, contains traces of oxyd of nickel." So that the nature of the great serpentine band of the Eastern Townships, is in most respects identical with that of New Caledonia. Likewise the economic minerals found in both are the same; nickel, chrome iron and asbestos, but the latter in New Caledonia is too brittle and short in fibre, to be of any commercial value. On the other hand cobalt occurs in paying quantities in New Caledonia, but so far has not been discovered in the Canadian serpentines.

In a paper read by Dr. A. R. Ledoux before this Institute two years ago, he describes the occurrence of nickel ore in Oregon, under conditions precisely similar to those prevailing in New Caledonia. These deposits however cannot be compared in extent and richness with those of New Caledonia.

The rocks of New Caledonia have been subjected to severe seismic disturbances, in which the serpentines have been fissured and broken. This shattering has facilitated the disintegration and decomposition of the rock, into the cracks and crevices of which the original metallic constituents have segregated. From these the nickel ore of commerce is dug. Occasionally veins are met with having a width of from six inches to two feet but they are not found to be persistent in either length or depth. They are usually filled with boulders of the enclosing rock cemented together by a rather higher grade of the nickel silicate. In other places the ore forms a covering to the rock, which gradually gives place to the scattered seams, but in no place does the ore extend beyond a depth of from fifteen to twenty feet from surface.

Pisolitic iron occasionally forms a heavy covering to the ore. It yields when dried from 50 p.c. to 60 p.c. iron, 3 p.c. to 5 p.c. chromic oxide and is practically free from phosphorous and sulphur. Immense fields of this exist.

Mr. Thomas Moore, an accomplished chemist and metallurgist of Noumea, and Government Assayer, has made numerous analyses of these ores, which occur as a hydrated sesquisilicate of nickel, varying

in nickel contents, as that metal is more or less replaced by magnesia, ferric oxide and alumina.

These ores were first discovered about thirty years ago by Mr. Jules Garnier and were shortly after named Garnierite. For some succeeding years attention was directed entirely to the green coloured ores and these were dressed up by hand to a value of 12 p.c. to 15 p.c. nickel. The brownish coloured, or what is locally called chocolate ore, has been thrown away as waste, but upon investigation it was discovered that this contained a large percentage of nickel and since then, it has constituted the bulk of ore shipped. The shipping ore is usually brought up to an average tenour of from 7 p.c. to 8 p.c. nickel, dry, that is after the hygroscopic moisture has been evaporated, which varies from 10 p.c. to 25 p.c. The following is an analysis of what may be considered a fair sample.

|                            |                               |
|----------------------------|-------------------------------|
| Silica.....                | 43.00                         |
| Sesquioxide of chrome..... | 0.50                          |
| Peroxide of iron.....      | 14.00                         |
| Alumina.....               | 1.50                          |
| Magnesia.....              | 21.00                         |
| Protoxide of nickel.....   | 9.00 (metallic nickel 7 p.c.) |
| Protoxide of cobalt.....   | 0.25                          |
| Moisture.....              | 11.00                         |
|                            | 100.25                        |

Large quantities of much higher grade ore are mined, but these are mixed with the lower grade mineral to maintain something like a general average.

The rugged mountain range which forms the backbone of the island rises into peaks over 5,500 feet in height which are composed of serpentine and the original rocks from which it has been derived. Ore is not found on the higher elevations but on the flanks and spurs which descend to the coast on either side.

From the nature of the deposition of these ores, they are spread over a large area, but confined to a comparatively shallow zone; seldom going below an average depth of from fifteen to twenty-five feet. Therefore the extent of these individual deposits can be approximately ascertained by costeans and shallow trial pits. The ore occurs in a more concentrated condition near the tops of these mountain spurs. Hence the invariable custom followed in New Caledonia of attacking first the upper parts of these deposits, as they can be more readily worked and yield a larger proportion of shipping ore.

This is a practice objectionable in two ways, as, at the beginning, the mine is robbed of its richest ore, which ought rather to be worked proportionately with the lower grade mineral. Then in operating, the waste and debris are thrown down below, where frequently these have to be moved again in order to open up the lower and poorer benches. It is evident that the proper way to work these ore deposits, is to prospect the ground thoroughly, then remove all available ore from the lowest bench first, after which the waste from the next bench above could be thrown into the lower excavation, and so on with each ascending bench or terrace. A certain proportion of the richer ore from the upper part of the deposits, could be mixed with the lower grade, to bring up the average tenour of shipment.

In mining these ores no blasting is required, as the shattered and decomposed rock yields readily to pick and shovel. The ore is gathered into piles, then sampled and analysed. A ticket is put on each pile showing its grade, so that when shipped a proper mixture may be made, ensuring an average of not less than 7 p.c. nickel. The waste dumps usually carry 3 p.c. to 4 p.c. nickel, but from the nature of the ore, no mechanical means has yet been devised by which the metal can be saved. Smelting is the only successful method of so doing, but the cost of fuel, flux and labour limit this treatment to ores yielding not less than 5 p.c. nickel, while it does not pay to ship ores of less than 7 p.c. tenour.

The mines of Le Société Nickel have been worked for nearly 20 years and apparently the present output can be maintained for many



years. The International Nickel Company has acquired some extensive and valuable properties near Bouloupari; for instance one deposit on the Perle de Koa concession carries upwards of 400,000 tons of ore by actual measurement. Ten years ago, a few hundred tons were shipped from there which averaged 10 p.c. nickel and a sample taken from the remaining waste dump yielded 6 p.c. of that metal.

The Vorarlberg concession adjoining, has an area of 7,286 acres. It has been prospected by costeans and trial pits over a considerable portion of its surface.

Samples from innumerable openings were taken which showed that almost inexhaustible quantities of ore of shipping and smelting grades exist, capable of themselves to supply the present world's demands for many years to come.

The ore is taken from the piles referred to and dumped into a bin, where the various grades are pretty well mixed, so as to average about 7 p.c. nickel. From this bin two wire ropes are stretched to the tramway below. The buckets which travel on these ropes, are connected by a light wire rope, which passes over a horizontal pulley, regulated by a brake, so that the loaded bucket hauls up the empty one.

At the Simon Mine near Dumbea, a single wire rope is used. The ore is filled in sacks which are slung to the hook of a free pulley and let go. These travel at a terrific speed until nearing the end, where the sag of rope causes a slight upward incline and finally the sacks are arrested by a strong buttress of wild grass which forms something of an elastic cushion. The pulleys are returned to the mine by pack horses.

The production of nickel during the last few years has ranged from 110,000 tons to 140,000 tons which is all shipped to Europe and the United States. No ore is smelted in New Caledonia although experiments attended with considerable success have been made by M. Caulry of Noumea. The ore is particularly well adapted for the production of ferro-nickel, as it is entirely free from sulphur and phosphorous.

The fonde or alloy produced averaged 55 p.c. to 60 p.c. nickel, 4 p.c. to 5 p.c. carbon with a little silicon and the balance iron. The slag was practically a mono-silicate of magnesia, lime and iron, and although rather viscid from the amount of magnesia present (22.02 p.c.) proved fairly clean. The nickel ran from 0.10 to 0.40 p.c. The consumption of fuel was however high, being accounted for in some measure by small furnace and light burden. Cold blast was used.

The labour problem is the most difficult to solve. The Natives are quite useless as labourers, but the Kanakas from the Loyalty Islands are good workers and easily controlled. The French libérés, or ticket-of-leave men, form a very unsatisfactory class of employés. Coolies from Pondicherry, and Chinese from Tonquin have been imported, but they have proved inferior to the Chinamen from more northerly provinces. Japanese have been brought in by contractors in considerable numbers. The contracts are very exacting, and the inspectors sent over by the Japanese Government are a constant source of friction on account of their own requirements, and demands on behalf of their countrymen. Over a hundred Dalmatians have been engaged within the last two years. Although paid much higher wages their labour is more economical and altogether more satisfactory. Free white men are employed only as superintendents and foremen.

It may be added that from this same formation in New Caledonia there were exported in 1901, 2,872 tons (metric) cobalt ore, averaging 4 p.c., 16,585 tons of chrome iron and 132,098 tons nickel ore.

The population of the Colony according to the latest census returns is 54,415, made up of 12,253 free, 10,506 of the penal classes and 31,656 non-European.

## Progress in Magnetic Concentration of Iron Ore.

By MR. J. WALTER WELLS, Toronto, Ont.

*Introduction.*—The future supply of iron ore is a problem which far sighted iron masters are at present investigating, as the present available supply is not calculated to last for many years.

Already the English and German iron works are importing ores from Spain and Sweden. In the United States the present available supply of high grade ore is not calculated to last more than 40 years, while the supply in Canada is apparently no more abundant so that it becomes a proper subject of inquiry as to the best means of utilizing the immense beds of low grade iron ores.

The production of pig iron continues to increase rapidly, for example in 1901 the total production of pig iron in the United States was, according to official statistics, 15,878,854 long tons valued at \$242,174,000, using 28,887,476 tons of iron ore, being nearly twice the production in 1896. In 1900 Canada produced 86,090 long tons of pig iron, while in 1901 the production rose to 244,976 tons, and is likely to increase rapidly. Iron ore cannot be said to reproduce itself in the same manner as forest or animal wealth. Iron masters are facing a constantly decreasing supply of high grade iron ore along with a constantly increasing consumption, so that sooner or later the low grade ores will be drawn upon. And it may be advisable to concentrate the low grade ores before using them in the furnace.

*What is Concentration?*—To the engineer concentration means the separation of the wheat from the chaff—the elimination of the worthless rock from the valuable ore. According to present practice in concentrating iron ores there must be some difference between the constituents of an ore either in hardness, specific gravity, or in magnetic permeability that is the relative susceptibility to a magnetic influence, in order to allow a separation of the particles. For example, it is comparatively easy to separate a granular hematite imbedded in a calcareous gangue. The calcite being softer than the hematite will crush finer for the same treatment, and as it is of relatively less weight than the hematite a system of crushing, sizing and treating in a pulsating jig removes the gangue from the ore.

Again, a hard dense magnetite associated with a soft schist would be amenable to concentration as the schist would crush finer than the ore, the resultant product after sizing in hydraulic classifiers being readily separated by jigs into heads consisting of pure ore and tails consisting of worthless rock.

Both the jig and the hydraulic classifiers depend on the difference in specific gravity of the different constituents. In the case of the common mixture of magnetite with pyrite both of about the same hardness and specific gravity, a system of water concentration would not give satisfactory results. But fortunately an electro-magnet has a greater tractive influence on the magnetite than on the pyrite so that we have a means of eliminating the pyrite from the magnetite when the grains of each constituents are entirely detached. How this may be done will be shown further on.

*Reasons for Concentrating Iron Ores.*—As iron ore cannot be said to be reproductive the constantly increasing demand for iron along with a decreasing supply of high grade ore will force the smelters to use low grade ores or find some means of enriching them at the mine in order to meet requirements in the furnace. The iron master demands as pure an ore as possible in order to make a cheap and high grade pig. For example, the standard ore of Bessemer grade on which all payments are made by most of the American dealers carries 63 per cent. iron, 0.045 per cent. phosphorus, 0.05 per cent. sulphur, and the per cent. of sulphur and phosphorus cannot exceed this limit without lowering the selling price of the ore. In smelting an ore high in iron contents less fuel, less fluxing material, and less labor are required than in using



a lean ore. Besides, the stock piles are likely to be more uniform so that less trouble is required in making up the charges for the furnace burden.

The blast furnace is practically a concentrating as well as a reducing machine. All of the constituents of the ore, except a portion of the metallic contents are separated into worthless slag, while the valuable pig iron is saved. Immense sums of money are annually spent in mining, transporting and fluxing in the smelter slag-making material in the ore.

A modern blast furnace costs considerably more than a modern concentrating plant both as regards original outlay and cost of maintenance. When the gangue or worthless part of the iron ore is treated in the blast furnace it must be transported, handled at least twice, melted and fluxed. By removing this gangue at the mine all of the expense of hauling, handling and eliminating in the furnace may be saved, and the ore will command a higher price at the smelter, as being a high grade uniform ore. According to present practice it takes one ton of coke to make one ton of pig iron. Most metallurgists will admit that about 400 lb. of the coke is sufficient to reduce the iron in the oxides, while the remaining 1600 lbs. are used up in melting the pig iron along with a mass of siliceous and earthy matter making up the slag. Of course a portion of this waste heat is saved in the form of gas used to heat the air blast, but a large quantity goes to heating, fluxing and getting rid of the extra amount of slag due to gangue matter in the ore. Hence it may be seen that it is better from the metallurgist's point of view to concentrate the ore at the mine rather than in the furnace.

The question may be resolved into a business proposition—will it pay to concentrate the ore at the mine?

If the extra price which the concentrated ore brings at the smelter together with the cost of hauling gangue material in the low grade ore is greater than the cost of concentrating the ore at the mine, then the operation will be a profitable undertaking. It cannot be profitable to deliver concentrated ore to the smelter in competition with an equally rich ore in the natural state, the costs of transportation being the same. But rich ores in the natural state are not abundant, so that there is always a chance for the concentrated ore to come into the market.

*Methods of Concentration.*—Hence it becomes a pertinent subject of investigation to determine the most efficient method of concentrating iron ore at the mine.

The simplest method of concentrating hard iron ores is by hand-cobbing, the laborer breaking up the ore to small sizes with a sledge hammer, picking out the good ore for use in the smelter, throwing the worthless rock to the waste heaps. In the case of soft iron ores intermixed with clay, different forms of washers are used. The log-washer commonly used in the Southern United States is a tilted cylinder rotating on its longer axis with side paddles forcing the ore upwards in a trough against a descending current of water washing away the clay and fine material through a screen at the lower end while the washed ore passes to the ore cars at the upper end.

In concentrating hard iron ores the product should have the coarsest possible size together with the highest possible purity to meet requirements of the market. The cost of crushing depends on the fineness of the desired product. The required fineness depends on the physical character of the ore—whether it is fine or coarse grained, whether the gangue is readily detached from the particles of ore. The cost of separating the ore per ton of finished product varies with the richness of the ore, that is the number of tons of crude ore which must be crushed to a certain size to obtain a certain concentrated product is an item of importance on the cost sheets. The richness of the ore depends on the amount of gangue material present, so that a complete petrographical examination of an ore will give you

a fair idea of how it will work by any system of concentration. For example, an ore is shown in Plate I, will be easily treated as the coarse grains of iron ore can be readily detached from the segregations of rock without fine crushing. Plate II, shows a section of an ore which is amenable to coarse concentration for the same reason. Plates III and IV show samples of ore which require quite fine crushing in order to completely separate the ore from the rock, while Plates V and VI show ore that is not amenable to any cheap method of concentration, owing to the fine particles of ore being so intimately intermixed with rock matter that very fine crushing is necessary, the product requiring briquetting before use in the smelter. It often happens that pyrite or apatite occurs in an ore which carries high iron values, but yet the ore is of no commercial value owing to the objectionable constituents. These deleterious constituents may be separated by magnetic concentration, and it is only a matter of how fine is it necessary to crush in order to detach the grains of the ore from the grains of the other constituents. For example, Plate VII shows an ore in which the pyrite shows as light colored stringers and segregated masses while the ore shows dark colored. Such an ore requires only medium fine crushing to a size of about 0.25 inch diameter to separate the pyrite from the ore. Plate VIII shows a dark colored dense magnetite with finely disseminated particles of pyrite scattered through the mass to be seen in the photo as light colored particles. In this ore it is almost impossible to eliminate the pyrite without very fine grinding, as particles of ore of even 0.10 inch diameter will have particles of pyrite clinging to them. Although fine crushing would eliminate the pyrite it could not be a commercial success at present owing to cost of fine crushing and the consequent briquetting of the fine ore.

When by petrographical means the character of an ore is determined it is necessary to determine the best method of concentration adapted to a particular ore.

In discussing the merits of water concentration, local conditions in Canada are against its use, as iron ore requires handling in large quantity to be profitable, which entails a costly plant consisting of jaw crushers, rolls, screens, jigs, expensive water piping, heating arrangements and large power capacity. The product is not always high grade as the gangue may have the same specific gravity as the ore, and it is not always possible to eliminate sulphides and apatite.

If the iron in an ore occurs in such a state that it may be attracted by an electro-magnet, then we have a simple method of separating the valuable ore from the worthless rock. Magnetites are most readily attracted by magnets, hence such ores lend themselves most readily to treatment. By increasing the strength of the magnet hematite may also be separated out as a magnetic head. Local conditions in Canada favor magnetic concentration as there is abundance of cheap water power available in the iron districts, while no expensive plant is necessary. The electric power may be used in running hoists, pumps, lighting system, compressors for air-drills, crushing machinery and the product may be hauled to nearest shipping point by electric trams. Cold weather has little influence on electric power while condensation of steam, freezing of water and air-conveying pipes often give trouble during a cold season. Magnetic concentration depends on difference in magnetic permeability, that is, some minerals are more susceptible to the influence of a magnet than others, so that they may be attracted, held or drawn away from other minerals not so susceptible, thereby effecting a separation. The magnetic permeability of different minerals has been worked out by Walter Crane (Transactions of American Institute of Mining Engineers, 1901) who arranges the most magnetic minerals in the following scale in descending order of permeability, thus:—

Magnetite  
Franklinite



Ilmenite  
Pyrrhotite  
Hematite  
Siderite  
Limonite.

The ideal method of crushing an iron ore for magnetic concentration would be to detach the different grains from each other without further crushing. Coarse crushing should be the rule rather than pulverization for two reasons (1) it is a waste of energy to reduce the ore finer than is necessary. (2) Fine ore as dust is not desirable for use in the blast furnace. Hence in any system of concentration the essential point is to find out what degree of fineness is necessary to release each individual particle from its neighbor. If the ore is crushed coarse, in many ores a magnetic portion will drag a non-magnetic portion attached into the heads thus lowering the quality of the heads. If the ore is crushed too fine there will be an adhesion of magnetic particles with the non-magnetic preventing a clean separation unless the ore is handled in water as by the Grondal-Delvik or Heberle separators or by air blast as in some of the dry separators. Besides, the iron master objects to using ore in the form of dust in the smelter. Hence it may be seen that each ore is a problem in itself, requiring careful experimental investigation to determine the best method of treatment, including the size of grain, the kind of separator best adapted, the pole, distance, etc. An encouraging feature of magnetic concentration is that sulphur in the form of pyrite and phosphorus in the form of apatite may be eliminated from many iron ores producing a Bessemer grade. Sulphur in the form of pyrrhotite cannot be separated from magnetite nor can phosphate of iron and phosphide of iron be readily eliminated as they are more or less magnetic and go into the heads. Experiments conducted by the writer have shown that in some titaniferous ores the titanium may be eliminated, but in pure ilmenite it is impossible to reduce the percentage of titanium by magnetic concentration.

*Present Status of Magnetic Concentration.*—The application of electro-magnets as a means of concentrating ores is not a novel idea, but its use on a commercial scale for concentrating iron ores, has been extended within the last 15 years.

In 1866 the late Dr. Sterry Hunt, of the Canadian Geological Survey, showed that a concentration by magnets was successful on the iron sands on the north shore of the St. Lawrence River. A charcoal iron smelter was started at Moisie making a good grade of charcoal iron, but could not compete in price with Swedish iron and the project was abandoned. The different types of magnetic concentrators which have met with more or less commercial success may be divided into four classes:—

(1) Those with the ore on conveying belts passing a magnetic field. Examples are the Conkling, Wetherill, Chase, Hoffman, Kessler, etc.

(2) Those with the ore on a rotating cylindrical drum within which are magnets. Examples are the Ball-Norton, Heberli, Wenstrom, Buchanan, Sautter, Siemens, Payne, etc.

(3) Those in which the ore falls vertically past magnets. Examples are the Edison, Heberli, Grondal-Delvik, Rowand, etc.

(4) Those in which static electricity is utilized, materials conducting the charge being repelled from those which do not become magnetized. The only example is the Blake-Morscher type recently invented and used at Colorado Zinc Works for separating zinc from lead ores.

It is beyond the scope of this paper to discuss the relative merits of the different machines, but a brief description of a few in commercial use may be of interest.

The Conkling separator is an endless travelling belt with three cross belts running at right angles to the main belt, underneath magnets

of different strengths, as shown in Plate IX, delivering different grades of ore. The non-magnetic tails are carried along the belt. This machine does not appear to have had much success. An improved form as described in Transactions of American Institute of Mining Engineers, 1890, was used at the Tilly Foster Mine in New York State, with success.

The Wetherill separators are made in several different forms adapted to suit requirements. Two types used at the Magnetite mines of Witherbee, Sherman & Co., Fort Henry, New York, for concentrating a magnetite carrying siliceous matter and apatite may be described. The Rowand type designed for highly magnetic ores is shown in Plate X being a diagrammatic vertical section. The crushed ore falling from a zig-zag delivery spout thus shaking up the particles passes a revolving drum alternately composed of brass and iron and magnetized by induction from the permanent magnet. The non-magnetic particles fall past the magnet while portions are held to the periphery till the center of the lines of magnetic force between the magnets is reached and as this zone is neutral the particles fall. Provision may be made to classify the material into several grades by baffles as seen in the plate. The construction of the rapidly rotating drum may be seen in plate IoA showing that a secondary concentration takes place, the magnetic material arranging along the bands of iron while the non-magnetic is thrown into the alternate spaces along the bands of brass. There is also a concentration of the lines of force at P owing to the point of the magnet projecting, and as all material passes through this field of strong magnetic forces it may be seen that there is little iron allowed to escape in the tails, while only a weak current may be necessary owing to the concentration of the force. This type of concentrator is used at Port Henry, treating a crude ore carrying about 45 p.c. iron and consisting of magnetite, apatite, hornblende, quartz, etc. The ore is crushed to 0.25" size passed through the magnetite separator delivering heads carrying 69 p.c. iron. The tailings are passed through a Rowand (Wetherill system) cross-belt machine removing the hornblende as a magnetic product leaving the tailings as almost pure apatite sold to fertilizer makers.

This machine designed for treating weakly magnetic material is shown in Plate XI. The cross-belts run under very strong magnets delivering material according to the strength of the magnet, while the non-magnetic material passes along the wide belt as tailings. The writer saw this machine remove ilmenite as one product from a sample monazite sand, cerite earths as a second product, leaving garnets, quartz, etc., as tailings. The separators made by the Wetherill Separating Co., in one form or another are able to remove garnets from corundum, siliceous matter, pyrite and apatite from iron ore, garnets from diamonds such as at Debeers Mines, Kimberley, South Africa.

The concentration of monazite sand by these machines gave an impetus to the industry of collecting rare earths for use in making incandescent mantles for lighting while the concentration of zinc ores such as franklinite at Franklin Furnace, New Jersey, is being done on a large scale. The machines will no doubt find still further industrial uses.

The Ball-Norton separator in practical use for the last 10 years has the following distinguishing features according to the inventor, Mr. C. M. Ball, Rockaway, New Jersey:—

(1) A stationary range of magnetic poles of alternately opposite polarity in the direction of the ore travel underneath while the drums enclosing the two groups into which the range of poles is divided may be rotated and may serve as carriers of the granulated ore, the iron particles being held upon the under side thereof by magnetic attraction.

(2) Means for applying a counter current of air to the moving mass of ore while it is suspended upon the under side of the rapidly running drums and being driven along through the machine.



The problem which the inventor, Mr. T. A. Edison, undertook to solve was the enormous one of quarrying rock carrying 25 p.c. magnetite, crushing it fine, separating magnetically the particles of magnetite from the ore by air blast, forming the clean pulverized ore into solid briquettes, loading and shipping the product to local furnaces at cost below that at



which Lake Superior ores could be delivered at the same furnaces in order to enable them to compete with the Pittsburg furnaces.

The ore body may be classed as country rock. It was quarried by blasting 2 inch holes 8 feet apart, 20 feet deep and 12 feet back from the working face.

The crude ore, thrown out in blocks often weighing 5 tons, was loaded by a steam shovel to skips dumping into giant rolls 6 feet in diameter and 6 feet face crushing the ore which was passed to 3 successively finer rolls, delivering ore crushed to 0.50" size and finer which was elevated to a vertical dryer 9 feet square and 50 feet high having alternate shelves of cast iron tilted at 45° downwards.

The dried ore was elevated to a stock house and conveyed to rolls and screens of about 0.10" size of holes the oversize returning to the rolls while the fines were allowed to fall past a series of horizontal magnets deflecting magnetic particles carrying 40 p.c. iron and allowing the tailings to fall vertically into conveyors leading to waste heaps. The concentrates were dried, crushed to about 0.05" size and treated by a second series of magnets delivering concentrates carrying 60 p.c. iron which were subjected to an air blast removing apatite as a finer dust and passed to a third series of magnets making a final concentrates of Bessemer grade carrying 68 p. c. iron and tailings which were reground and returned to the separator. The final concentrates were mixed in cylindrical machines with rosin soap and compressed into briquettes 3" by 1.5" which were heated in drying ovens to 600° F to render them waterproof, hard to endure handling, porous to enable furnace gases to penetrate, and non-friable to resist the action in the blast furnace.

The capacity of the plant was 300 tons of rock per day, one-quarter of which was made into briquettes, the remainder being sold for building purposes.

The system was a marvel of engineering skill, automatic from start to finish, but was not continued as it did not prove profitable. A drawback was the friability of the briquettes in the blast furnace. Local iron men appeared to be satisfied that the operation would be profitable if the price of Lake Superior ores should rise 75 cents a ton.

It is proposed to use the Edison system on low grade Norwegian ore owned by the Dunderland Iron Ore Co. shipping the concentrates to English furnaces.

The Grondal-Delvik separator is adapted to finely crushed ore employing water as a means of cleaning dust from the ore.

Plate XIX shows a diagram section. The ore enters at N together with water from N to L and passes along side the cast iron drum A B which has coils of copper wire carrying electric current so that magnetic particles are held to the iron rings while non-magnetic particles are washed down into P.

The wooden drum C C revolving 3 times faster than A B has steel pegs on its periphery which become magnets by induction causing particles to hop across carrying them around to the demagnetized portion where they are worked down by water from K.

This separator has been working since 1894 at Pitkaranta, Finland, treating a low grade magnetite carrying 25 p. c. iron mixed with chalcopryite and zinc blende.

The Blake-Morscher system of ore-dressing by static electricity is the recent invention of Prof. L. J. Blake, of the University of Kansas, and is said to have met with success in treating zinclead ores at the Colorado Zinc Works, Denver, Colorado.

The method consists in bringing a mass of ore particles into contact with a statically charged metallic surface, such materials as passes conductivity are instantly repelled while those of low conductivity are not so rapidly repelled allowing them to be pulled out of the path and caught in a separate receptacle.

It is said to work well on iron ores.

#### USE OF FINELY DIVIDED ORE IN THE BLAST FURNACE.

An argument often brought forward against concentration of iron ores is that the concentrated product is too fine for use in the blast furnace. The writer visited many smelters and has ascertained that the present practice favors the use of finely divided ores as it is cheaper to smelt the fine ore.

Of course any ore less than 0.10" diameter should be briquetted but concentration methods generally avoid crushing finer than this size owing to greater cost so that concentrated ore is generally acceptable at the furnace.

#### OPPORTUNITY IN CANADA FOR CONCENTRATION OF IRON ORES.

The writer is at present making experimental investigation of different Canadian ores and regrets that the matter is not yet ready for publication. This paper is only a preliminary study of the present practice and if any new points have been brought forward of benefit to Canadian mining men, the writer will be satisfied.

In general it may be said that magnetic concentration can only be profitable where local conditions favor it, such as cheap labor, lack of competition with naturally rich ores, cheap power, etc.

#### Granby Consolidated.

During the month the mines and smelting plant at Phoenix of the Granby Consolidated Mining, Smelting and Power Company were inspected by a number of the New York directors representing the Nichols end of the enterprise. In an interview Mr. Luther stated that the chief impression made upon him, and he thought upon the rest of the gentlemen of the party, was the immense size of the ore bodies to be handled. The Granby Co. had an unlimited supply of ore, practically, of an even value per ton. With a good market, which is assured, plenty of capital and an economical management, this was the secret of the success of the Granby Co., which was properly handling the raw material and turning it into a marketable commodity. Every indication here in the way of construction and development showed plainly that those in charge understood the problem, and the results in time could not be otherwise than those hoped for. He had been told how large the ore bodies were in feet, but the impression was different from what he actually saw; large as he believed it to be, he found it immensely larger. Practically all the ore produced so far was in the process of development—getting ready to do work.

Mr. Herreshoff did not think there was any need for him to make any comment on the Granby Smelter, as it spoke for itself. The results now being achieved on low grade ores were most remarkable. Ordinarily some persons might be disposed to hesitate to handle or develop a proposition with such low grade ore, but the conception of this enterprise, in its magnitude showed great depth of thought and remarkable attention to details. Had it not been for the economical methods in use it is a question whether it could have been made a commercial success. In its smelting operations the Granby Co. was favored by the fortunate composition of the ores. The bessemerizing was up to date in every respect, and he believed the company would become one of the leading factors in the copper industry on the American continent.

The Granby Smelter this week treated 4808 tons, making a total of 140,139 tons for the year.

|                  | Week.  | Total.  |
|------------------|--------|---------|
| Granby .....     | 4,012  | 148,464 |
| Mother Lode..... | 3,706  | 42,274  |
| Snowshoe.....    | 2,100  | 19,590  |
| B. C.....        | 1,200  | 12,445  |
| Emma .....       | 300    | 9,206   |
| Sunset .....     |        | 4,305   |
| Providence.....  |        | 551     |
|                  | 11,318 | 236,835 |

**Velvet Rossland Mine.**—The manager cables: "South drift of level No. 2 have drifted 50 ft.; the ore is 5 ft. thick entire distance. Drift is looking exceedingly well. Will be able to ship 20 tons of ore daily, if able to obtain teams; 350 tons are now ready for shipment. South drift of level No. 3, the ore is coming in. Mine promises exceedingly well for the future.



**Coal Cutting Machinery.**

A paper was read by Mr. Owen Hughes, at a meeting of the Manchester Geological Society, held on April 21st, on "Coal-cutting by Machinery," which recorded the operations extending over a considerable period. The advantages claimed for coal-cutting machines were as follows:—

- 1.—Increase in the proportion of round coal.
- 2.—Smaller loss in working.
- 3.—In most mines a reduced working cost.
- 4.—A reduced necessity for the use of explosives, amounting in some mines to entirely dispensing with shot-firing, thus removing a great element of danger.
- 5.—A larger output from a smaller area in a given time.
- 6.—Reduced loss and cost of timber, together with fewer accidents from falls.
- 7.—A larger daily wage for the collier, whilst relieving him from the most dangerous and laborious part of his work.

Mr. Hughes then proceeded to give details of the results attained by using both rotary and percussion machines worked by compressed air.

In the course of a discussion the Chairman (Mr. Hy. Hall) said that if Mr. Hughes's statement that he gained an advantage of from 10d. to 1s. 9d. per ton by the use of these machines was correct, it was a wonder that they were not in every colliery? With regard to the increased quantity of round coal he thought it came from the fact that the coal-cutter holed in dirt, whereas the man holed in coal. He wanted to know why the coal-cutter could hole in dirt when a man could not. Was it too hard for the man and not so for the coal-cutter? Another point was with regard to the quality of the slack. The slack made by the machine was almost worthless, whilst that made by the man might in many cases be sold as nuts.

**Lead Smelting Costs.**

Mr. S. S. Fowler, S.B., Mining Engineer and Resident Manager of the London and British Columbia Goldfields, Limited, contributes to a recent issue of the *Nelson News* an interesting letter on the question of lead smelting costs which we take pleasure in reproducing:

I learn from Eastern Canada that the impression is going abroad there, as a result of articles that have appeared in some of our papers, that the B. C. lead miners are just finding out that they have been on the wrong scent, and that a reduction of smelter and freight charges is the natural and easy way to make lead mining profitable in British Columbia, and that, if this were done, duties and bounties would not be needed. If this be so, and the government be influenced by such irresponsible statements, more than by the representations made by our delegates and the speech made by our member in the house, in which he stated that the smelting and freight rates had been investigated and found reasonable, it will have little excuse; but, nevertheless, it is most regrettable that public sentiment should be educated in the wrong direction instead of the right when we have still to win our fight for lead duties, at least conforming to the general tariff of Canada.

It would be difficult in a brief letter to go fully into the question of smelting costs in different places and under different circumstances, and to make clear the effect upon the smelting rate for lead ore, of the supply of other ores necessary to flux with it, and other matters of a somewhat technical nature. For this I have little time, and you perhaps hardly space enough.

It seems to be the impression of some, in discussing the rate question, that a smelting rate can be arrived at like a milling or manufacturing rate, but this of course is very wide of the mark. With the same prices for wages and material, and with equally well equipped plants and able metallurgical supervision, the cost of smelting one assortment of ores may be double what it would be with another. It would seem strange indeed, if there is a good margin of profit in lead smelting, that none of the talked of smelters have materialized, and that the Trail smelter is smelting no lead ore, and the Nelson plant running at, perhaps, half capacity, when by a reduction in rates they could produce business enough to keep them fully occupied. I certainly hope for lower rates in the near future, with the increasing development of mines supplying larger quantities of ore, and a more nearly self-fluxing combination than is the case at present.

Mr. Cavanaugh, in his letter published in *The Daily News* of June 10th, shows that he is under an evident misapprehension, which has naturally led to the belief that the smelting rates could be materially reduced without giving the smelters and railways a smaller earning than they had some years ago. That is due to Mr. Cavanaugh's not knowing, apparently, that the lead from ore bought in Canada was not used for domestic consumption in the United States, for the American mines have been, for several years past, supplying the domestic lead for the United States. The foreign lead was smelted and refined in bond, and 90 per cent. of the assay contents of the ore or bullion exported, leaving a small amount which might be sold at home without payment of duty. The smelter therefore had, in addition to his freight and treatment charge, a profit on his lead over the price paid the Canadian miner based on the New York price less brokerage, and duty on the lead paid for and on the lead not paid for, i.e., payment was made for 90 per cent. assay contents and duty charged on 100 per cent. When we sold ore to American smelters the brokers' price paid to the miner was always from 15c. to 30c. per one hundred pounds less than what the refiner received in New York.

To make clear the improvement there has been in smelter rates since 1896, I have taken examples of Whitewater product for different periods, and made comparisons, showing on the one hand what we received, and on

the other what we would have received if we had had the advantage of settlement on the basis of London price less \$1.00 per 100 pounds and the present freight and treatment rate:—

| OLD METHOD.    |        |                                  |                      |                                | NEW METHOD.                    |                              |                            |                |        |
|----------------|--------|----------------------------------|----------------------|--------------------------------|--------------------------------|------------------------------|----------------------------|----------------|--------|
| Date           | % Lead | Gross Lead Contents per ton lbs. | N. Y. Price Less 20c | 90% of Total Value Lead in Ore | Freight and Treatment          | Duty $\frac{3}{4}$ c per lb. | Net Value Lead per Ton Ore | Date           | % Lead |
| 1896.....      | 30.8   | 616                              | \$2.78               | \$15.41                        | \$22.50                        | \$ 4.62                      | \$11.71 loss               | 1896.....      | 30.8   |
| Jan. 1897..... | 33.7   | 674                              | 2.84                 | 17.23                          | 18.75                          | 5.06                         | 6.58 "                     | Jan. 1897..... | 33.7   |
| Dec. 1897..... | 33.7   | 674                              | 3.50                 | 21.23                          | 18.75                          | Duty $1\frac{1}{2}$ c        | 7.63 "                     | Dec. 1897..... | 33.7   |
| 1898.....      | 30.9   | 618                              | 3.58                 | 19.91                          | 18.75                          | \$10.11                      | 8.11 "                     | 1898.....      | 30.9   |
| 1899.....      | 46.6   | 932                              | 4.27                 | 35.82                          | 20.00                          | 9.27                         | 1.84 gain                  | 1899.....      | 46.6   |
| Date           | % Lead | Gross Lead Contents per ton lbs. | Average London Price | Equivalent Less \$1            | 90% of Total Value Lead in Ore | Freight and Treatment        | Net Value Lead per Ton Ore | Date           | % Lead |
| 1896.....      | 30.8   | 616                              | 11- 3-9              | \$1.417                        | \$ 7.86                        | \$13.16                      | \$5.30 loss                | 1896.....      | 30.8   |
| Jan. 1897..... | 33.7   | 674                              | 11-15-0              | 1.539                          | 9.33                           | 13.74                        | 4.41 "                     | Jan. 1897..... | 33.7   |
| Dec. 1897..... | 33.7   | 674                              | 12-12-6              | 1.728                          | 10.46                          | 13.74                        | 3.25 "                     | Dec. 1897..... | 33.7   |
| 1898.....      | 30.9   | 618                              | 13- 0-0              | 1.809                          | 10.06                          | 13.18                        | 3.12 "                     | 1898.....      | 30.9   |
| 1899.....      | 46.6   | 932                              | 14-18-9              | 2.228                          | 18.69                          | 15.00                        | 3.69 gain                  | 1899.....      | 46.6   |

The question of the 10 per cent. deduction from the lead and the 5 per cent. of silver is sometimes introduced in considering rates, but there is little ground for this. Hixon says on pages 56 and 57:

"The losses in lead smelting are generally estimated at 5 per cent. Ag. and 10 per cent. Pb., and in making purchases of ore it is customary to make this deduction from the metallic contents of the ore in making payment. The actual losses, or such as are known in statements vary according to local conditions of charge, plant, and ability of the metallurgist...."

"Properly speaking, the losses in lead smelting can be kept within the allowed limits of 5 per cent. Ag. and 10 per cent. Pb., but to do this it is necessary that the furnaces shall not, etc...."

"The writer has had returns from months during which the results on accurate charging of all contents represented a loss of 4 per cent. Ag. and 8 per cent. Pb., and in other months 7 per cent. Ag. and 14 per cent. Pb."

The figures quoted from Hoffman by Mr. Campbell-Johnston giving smelting costs, do not include management, clerical expense, interest on ore and other items which must be taken into account. For various reasons, which I would be quite willing to go into at length, if necessary, I do not give the information necessary to determine what a reasonable charge for treatment would be here. From my knowledge of the conditions and my past smelting experience, I do not think the present rates excessive.

**Maritime Coal Company.**—This company, which purchased the Chignecto colliery of the old Londonderry Iron Company, has spent about \$100,000 in pumping out the old workings, in development and in the construction and equipment of a line of railway from Chignecto to Maccan on the Intercolonial Railway. They are now down a distance of about 1400 feet and have levels run off at 600 ft. and 1000 ft. The plant has been greatly improved, and the output, it is expected, will shortly be increased to 400 tons per day. The coal from the lower levels has given excellent results from tests made on the Intercolonial and Quebec Central Railways. Mr. James Baird, one of the oldest active colliery managers in Canada, and one of the most capable, is in charge of the property.

**POGSON, PELOUBET & CO.****PUBLIC ACCOUNTANTS**

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building



## Canadian Graphite.

By H. P. H. BRUMELL.

Notwithstanding the present activity of mining in the Provinces of Ontario and Quebec, but little seems to be known of the extent and richness of the ores of graphite, the value of the industry or the variety of uses to which the mineral is put. Without going into details it may be stated that by far the most important use of graphite is in the steel, copper and copper-alloy industries as a refractory material in making crucibles, retorts, muffles, boxes, stirrers, etc. Other important uses are for lubricating, foundry facings, stove-polish, paints, electrotyping and pencils.

The two well-defined trade divisions of this mineral are "amorphous" graphite and "crystalline" graphite. The former is usually of lower grade and more suitable for facings, paint, pipe-joint grease and stove-polish, although the better qualities, particularly from Bavaria and Mexico, are used also in the manufacture of pencils and electrotyping, while for crucible making, lubrication, high grade stove-polish and electrotyping, the purer or crystalline variety is generally necessary. The principal source of supply of crystalline graphite is the Island of Ceylon, from whence the ore is shipped in its crude form, after being sorted and sized, the grades being "lump," "chip," "dust" and "sweepings." The first two sizes form the bulk of the output used by crucible makers, while the "dust" and the "sweepings" are utilized for lubrication stock.

Amorphous graphite is found principally in Nova Scotia and New Brunswick, where it occurs as graphitic shale and clay. The most important deposits are those in the vicinity of St. John, N.B., others of lesser note occurring in Kings and Westmoreland Counties, N.B., and at Lochaber, N.S. In Ontario several deposits of amorphous graphite have been found in Haliburton and Hastings Counties, while in Brougham Township, Renfrew County, a very extensive deposit occurs, having associated with it a considerable proportion of flake or crystalline graphite. This property is being operated by the Ontario Graphite Company, which has lately installed an expensive plant, and is now refining and shipping the product.

The largest known deposits of crystalline graphite are in the Counties of Ottawa and Argenteuil, Quebec. Smaller deposits occur in Lanark, Leeds and Frontenac Counties, Ontario. Of this quality there are two distinct classes of ore, "lump" and "disseminated," the former usually occurring in limestone, as nodules, or filling pockets and small veins. There are also many minor occurrences where the lump ore constitutes small veins in diorite or other igneous rocks. As yet no discovery of lump has warranted systematic mining. Disseminated graphite ore is practically a Sillimanite or other gneiss carrying graphite in a flaky or crystalline form, and varying in graphite content from a trace to 35 per cent. These bands of gneiss are found in the Townships of Buckingham and Lochaber, Ottawa County, many beds having a thickness of over 20 ft., and assaying on an average about 20 per cent. of graphite. A number of beds have been opened and ore extracted and treated at the different mills in the district, more especially in later years at those of the North American Graphite Company, the Buckingham Company, and the Walker Mining Company.

As in many other industries the process of manufacture adopted by the different producers has been jealously guarded, the different "secrets" being considered the individual property of the refiner. Irrespective of secret methods, the practice adopted may be divided into wet and dry processes. No mill confining its operations to the dry or air method has as yet been commercially successful, because the similar gravity of the component minerals prevents a satisfactory separation. Several pneumatic separators lately put on the market have been partially successful, although they have not been able to eliminate the mica.

The wet or water separation method has been successful to a marked degree and high-grade graphite is being produced in this manner by the North American Graphite Company, of Buckingham, which is, at present, the only company in operation in the Province of Quebec. It is expected that the plant of the Walker Mining Company will soon be at work. In the process of concentration used by these companies the ore is crushed and stamped wet, and a coarse separation made by stationary buddles. The concentrates are then dried, ground by buhr-stones and screened. An improvement, resulting in a saving in cost of about 25 per cent. has lately been made by the use of the Brumell separator, which treats the ore after drying by flotation upon, rather than immersion beneath, the surface of the water. By the wet method a higher degree of concentration is obtained than by the dry process, and the ground and finished concentrates retain their size of

particle to a marked degree. As a consequence, those companies, which employ wet methods are enabled to put upon the market the largest sized and purest flake crucible and lubricating stock.

Analyses of picked samples of graphite made by the Geological Survey of Canada have shown the following results:

| Locality.                                    | Carbon per cent. |
|----------------------------------------------|------------------|
| Buckingham Township, Quebec (foliated).....  | 99.675           |
| Buckingham Township, Quebec (columnar) ..... | 97.626           |
| Grenville Township, Quebec (foliated).....   | 99.815           |
| Grenville Township, Quebec (columnar) .....  | 99.757           |
| Ticonderoga, N.Y. (foliated).....            | 99.656           |
| Ticonderoga, N.Y. (columnar).....            | 97.422           |
| Ceylon (foliated).....                       | 99.679           |
| Ceylon (columnar).....                       | 99.792           |

It is a generally accepted fact that the world's supply of crystalline graphite needs to be increased because of the growth of the iron and steel industry, the largely extended use of copper and its alloys, the wider application of electricity and the increased needs for graphite lubrication. Flake graphite is known to exist only in crystalline rocks which, in the Laurentian series, has the greatest development in Canada, a feature which presents a promising future for the graphite industry of the Dominion.

**Cape Breton Coal, Iron and Railway Company.**—This company is preparing to develop its coal areas at Cochrane's Lake and Black Brook, Mira. The company controls 57 square miles of territory, containing seams of coal of various thicknesses, 12 square miles have passed Government inspection as being 5.5 ft. thick. The coal is pronounced of excellent quality. The company is capitalized at \$4,000,000, the shares being \$100 each. There is considerable American capital back of the company, but it is understood that the Royal Bank of Canada will take the bulk of the stock.

## Sale of Valuable Zinc Mine IN CANADA

Pursuant to the order of the High Court of Justice, for the winding up of the Grand Calumet Mining Company, there will be offered for sale by Public Auction at the Local Master's Office, in the Court House, in the City of Ottawa, in the Dominion of Canada,

**On the Sixth day of October, 1903,**

**AT 2.30 P.M.**

Mining Location 30 T, in the District of Thunder Bay, in the Province of Ontario, containing 160 acres, and known as "The Zenith Zinc Mine." The property is about twelve miles from Rossport Station on the C. P. Railway. A considerable amount of development has been done, and about 2,000 tons of ore have been extracted.

The property will be offered for sale subject to a reserve bid, and to a royalty of \$3.00 per ton on all ore to be mined thereon. With it will be put up for sale, a quantity of mining plant and machinery, consisting of engine, derricks, cables, drills, carpenter's tools, blacksmith's tools, bar steel and iron, rope, saws, stoves, &c.

A detailed inventory of the chattels, an expert analysis of the ore, and any other information may be obtained from the liquidator.

Ten per cent. of the purchase money must be paid at the time of sale, and the balance in thirty days.

Dated the 13th day of June, 1903.

**E. A. LARMONTH,**  
Liquidator,  
48 Elgin St., Ottawa, Canada.

**W. L. SCOTT,**  
Local Master  
at Ottawa.



## COMPANY NOTES.

**New Fairview Corporation.**—This company is installing a cyanide plant of a capacity of 200 tons per day.

**Crow's Nest Pass Coal Company.**—The output from the company's collieries for May was as follows:—Coal Creek, 17,796 tons; Michel, 28,849 tons; Morrissey, 15,081 tons. The output for June is expected to reach quite 75,000 tons.

**Le Roi.**—Cabled returns for May:—"Shipped from the mine to Northport smelter during May, 1903, 10,665 tons of ore, containing 4,715 ozs. of gold, 5,091 ozs. of silver, and 236,900 lbs. of copper. Estimated profit on this ore, \$14,500."

**New England Canadian Asbestos.**—This company which acquired the Beaver and other working properties at Thetford Mines, Que., has suspended operations. The company, which worked at one time Vermont asbestos, appears to have been a failure all along the line.

**Canadian Amber Mica Company, Ltd.**—Registered June 5. Capital, £5,000, in 5s. shares. No initial public issue. The first directors (to number not less than two nor more than seven) are to be appointed by the signatories. Registered office: Tower Chambers, Finsbury Pavement, E C.

**International Coal and Coke Company.**—This enterprise, practically a subsidiary company of the Granby Consolidated Mining Smelting and Power Co. is proceeding with the development of its colliery, near Blairmore Alta. The authorized capital is \$3,000,000 in shares of a par value of \$1.00. The officers are:—A. C. Flumerfelt, president; H. N. Galer, treasurer; and W. G. Graves, secretary. At date there are about 600 feet of drifts on the various seams. The coal is of good coking quality, and when the coking plant is completed the company will be in an excellent position to supply the Granby Smelter.

**Tyee Copper Company.**—This company had a very successful month during May. The report to the head office at London, England, shows most

gratifying returns. There has been in May 4,260 tons of ore smelted. The company ships its matte to the Tacoma smelter, and the receipts for the present month have been \$63,500. The output from the Tyee has continued very steadily since the smelter was installed at Ladysmith. For March, with only 25 days' smelting, there was a yield of \$52,336; in April 4,550 tons of ore were smelted 418 tons of matte produced. The value of the products for April was \$60,313. The month of May has followed with a production similar to that of the preceding months.

**Snowshoe Gold and Copper.**—For several weeks past the tonnage from the Snowshoe has been steadily getting larger, and it is fully expected that, with normal conditions, it will soon be enlarged to 500 tons daily, which could be maintained from the property without trouble. General work at the Snowshoe has also been progressing most favourably of late, ore being shipped from several parts of the mine, including the new glory hole, near the end of the No. 2 railway spur, which is said to be some of the best in the mine. On the main incline shaft the work of timbering it to the third level and below is completed, and the pocket at the foot is also finished, so that as soon as the rails are laid for the two-ton skips to run on, the shaft will be ready for use. The new 150 h.p. electric hoist, the first of its kind and the largest of any kind in the Boundary country is all ready for use, and will probably be placed in commission on or about the 1st of July. The new 150 h.p. boiler, the largest yet brought into the Boundary, is expected to arrive before long and will largely augment the boiler capacity of the mine.

**Nickel Plate Mine.**—Development on this mine has continued during the year with a force of 25 to 50 men, and about a mile of underground work has been completed in all, and 350 feet in depth has been attained. During the year it was decided to build a plant for the reduction of ore, and the erection of a 40-stamp mill, with concentrators and cyanide plant, is now in progress. The works are situate at the junction of Twenty-Mile Creek and the Similkameen River. The motive power for the mill will be taken from Twenty-Mile Creek at a point about 3 miles distant from the mine. A tramway to carry the ore from the mine to the mill was begun during the latter part of last year, and it is expected the completed plant will be in operation by the latter part of the present year.



GOODS SENT SUBJECT TO APPROVAL

# BERNARD BANDLER

IMPORTER OF

## CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



# LAURIE ENGINE COMPANY

MONTREAL - - CANADA

# IMPROVED

# CORLISS

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

# ENGINES

FOR ELECTRIC LIGHT and POWER PLANTS.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

## 1903

THIRTEENTH  
YEAR

BY

### B. T. A. BELL

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

A Complete

Directory

to all

Canadian

Collieries

Blast Furnaces

Mines

Quarries

Mills

Smelters

and

Mineral

Producers

Endorsed

by the

Canadian

Mining

Profession

Authentic

Information

Concerning

their

History

Organization

Capital

Dividends

Accounts

Operations

Statistics

Plants

Labour

Approved

by the

Mining

Financial

Press

This standard work of reference to Canadian Mining under-  
taking and active industries is now printing and  
will be issued in July.

## A COMPLETE MINING DIRECTORY

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces

For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

Subscribe  
for it.

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

Advertize  
in it.



FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

F. E. LEUSHNER,

Room 12, Janes Bld., TORONTO, Canada.

**A. LESCHEN & SONS ROPE CO.**  
920-922 N. 1<sup>ST</sup> STR. ST. LOUIS, MO.

BRANCH OFFICES: 92 Centre St., - NEW YORK, N. Y.  
137 East Lake St., - CHICAGO, ILL.  
85 Fremont St., - SAN FRANCISCO, CAL.

**WIRE ROPE & AERIAL WIRE ROPE TRAMWAYS**



TRAM AT DE SIE MINE, TELLURIDE, COLO.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO., 52 Broadway, New York**

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

**4 TRAINS DAILY 4**  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

**E. J. CHAMBERLIN,**  
General Manager.

**C. J. SMITH,**  
Gen. Traffic Manager.

**W. P. HINTON,**  
Gen'l Passenger Agent.

**J. E. WALSH,**  
Ass. Gen. Passenger Agt.

## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

**60% PER ANNUM GUARANTEED**  
California-Nevada Mining Co.

on Par Value of Stock when Mill is completed.

**PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.**

\$20,000,000 **BLOCKED OUT**  
READY FOR THE MILL and the  
Hoodlum Claim, which adjoins the  
Old Victor Mine, yet to figure on.

A 200-TON PER DAY PLANT  
CONTRACTED FOR and will be  
in full operation not later than  
April 1st, 1903.

**PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.**

Do not fail to investigate this proposition, for the more you investigate the more  
stock you will want. Write for prospectus.

**W. H. BALDWIN & CO., Brokers and Financial Agents** 49-50-51-52 VOLCKERT  
BLDG., ALBANY, N. Y.  
REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trus. Company,  
Los Angeles, Cal.; any mining journal of the state or prominent mining men.



## Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works, mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

### SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

### PUBLICATIONS.

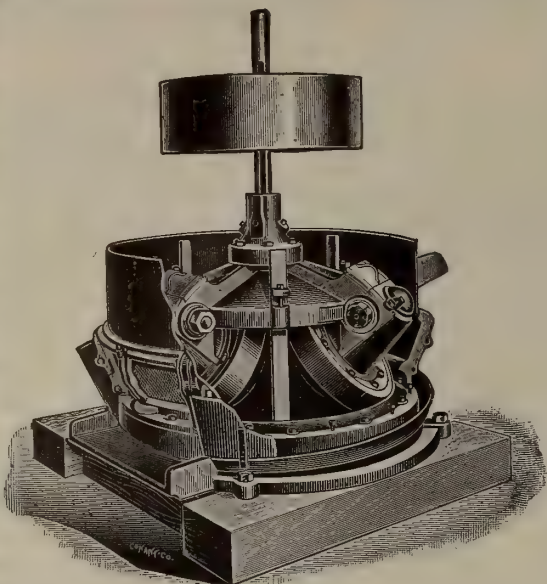
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

**B. T. A. BELL, Secretary,**  
Orme's Hall, Ottawa.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as millbuilders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

MONTREAL.

Obtain our Prices.

# MINE RAILS

## Cable Hoist-Conveyors



MANUFACTURED BY

## THE TRENTON IRON CO.

TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.  
Also, Wire Rope Equipments for Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated Canadian Mining Institute.

Vols. I, II, III and IV Canadian Mining Institute.

**\$20** WILL be paid for a complete sett of these volumes. Readers having any, or all, of these copies for sale please write to

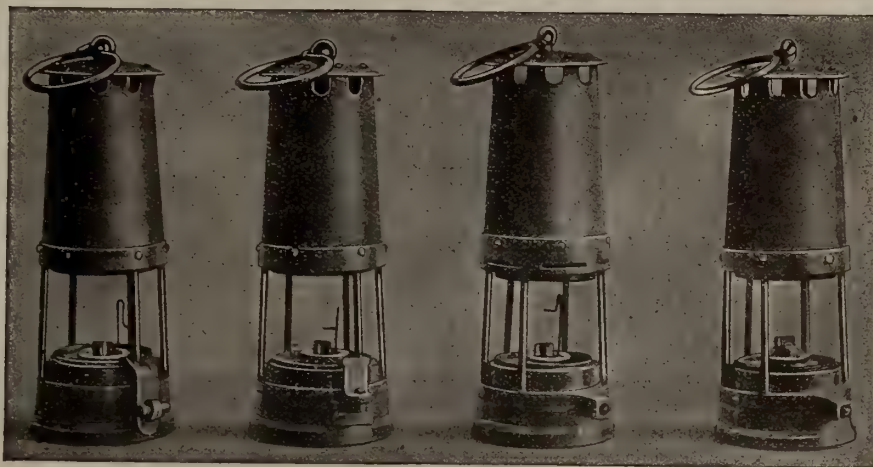
**The Canadian Mining Review**  
OTTAWA, Canada.



# JOHN DAVIS & SON (DERBY) Ltd. England

LARGEST MANUFACTURERS MINERS SAFETY LAMPS OF ALL KINDS

DAVIS'S PATENT ELECTRICALLY LIT LAMP TO BURN SPIRITS.



DAVIS'S "A1" DEPUTY'S FIREBOSSES AND SHOT-FIRER'S LAMP.



DAVIS'S "A1" DEPUTY'S FIREBOSSES AND SHOT-FIRER'S LAMP.

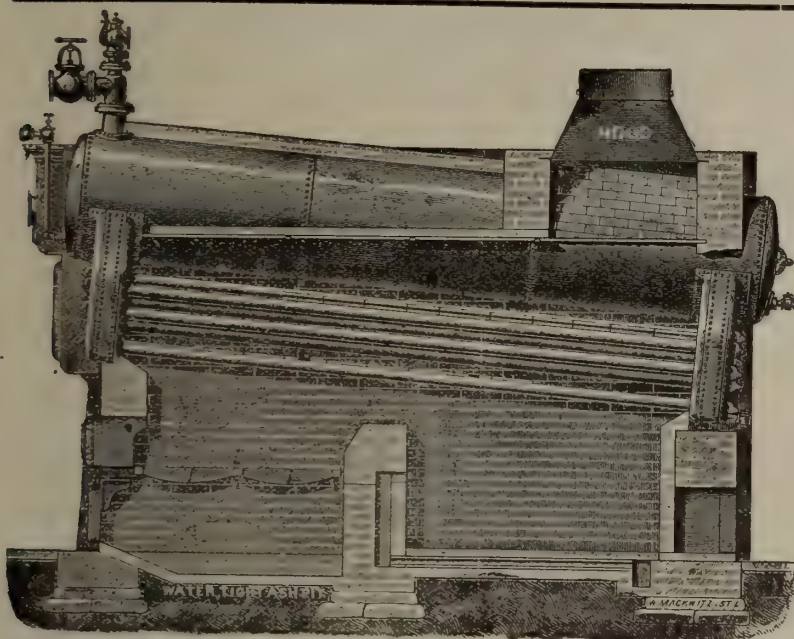
Stock at Montreal.

Sole Representative for CANADA

FRANCIS T. PEACOCK, M.E.,

Canada Life Building MONTREAL.

Send for Catalogue and Prices.

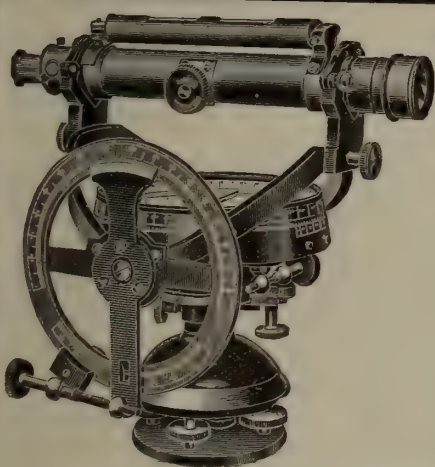


## HEINE SAFETY BOILER

MANUFACTURED BY

The Canadian Heine Safety Boiler Co.  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—W. F. STANLEY & CO. Ltd.

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

The Cumberland Railway & Coal Company

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

Head Office : 107 ST. JAMES STREET, MONTREAL

Address : P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\*; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

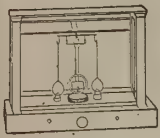
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.



## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



**The Chemists & Surgeons Supply Co. Ltd.**

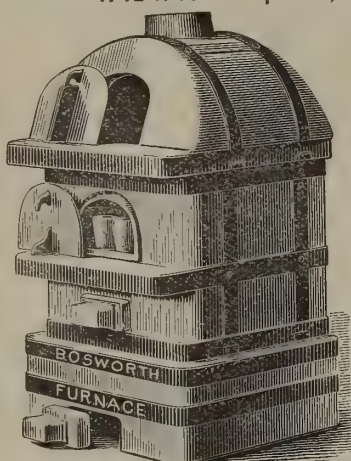
CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.



**ASSAYERS and CHEMISTS  
SUPPLIES.**

MANUFACTURERS OF

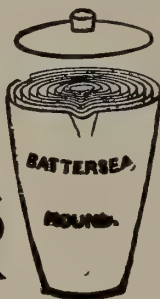
**Furnaces, Crucibles,  
Scorifiers, Muffles,**

and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

**COMPLETE ASSAY OUTFITS.**

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

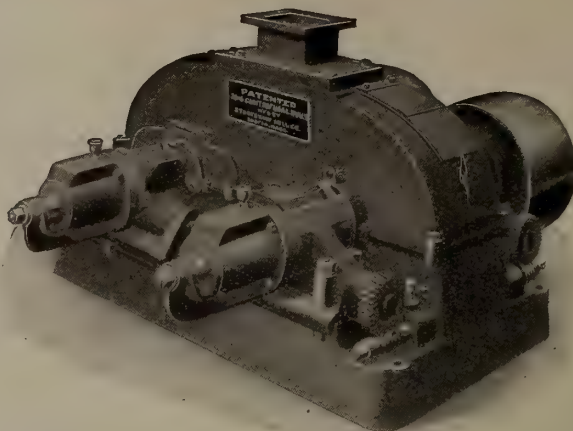
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.

## Centrifugal Crushing Rolls



**TIRES  
CUSHIONED BY SPRINGS**



Common Rolls are to spring-tired Centrifugals what the Dump Cart is to an up-to-date Rubber-tired carriage. Spring-pressed tires absorb crushing shocks. A cart, shaky enough at a walk, can scarcely hold together going faster on a road easy for a modern carriage.

If you are interested in a Roll constructed to LAST and turn out the largest product at the smallest expense, write for our catalogue of

**CRUSHING, GRINDING and  
SCREENING MACHINERY.**

## STURTEVANT MILL CO.

BOSTON, MASS.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.  
Wire specially selected for own exclusive use.  
We have made many records with our Winding, Haulage and Crane Ropes.

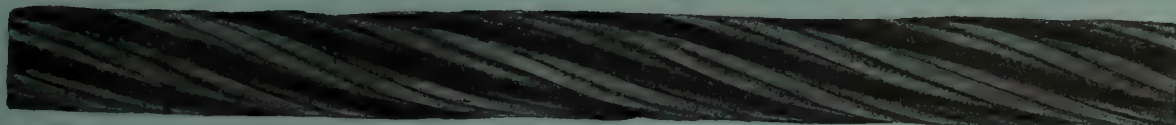


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Stear Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

**Montreal Pipe Foundry Co.**  
Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at: RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

**CANADA LIFE BUILDING, MONTREAL.**

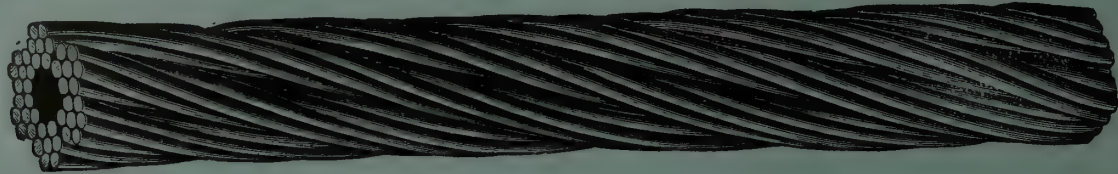
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

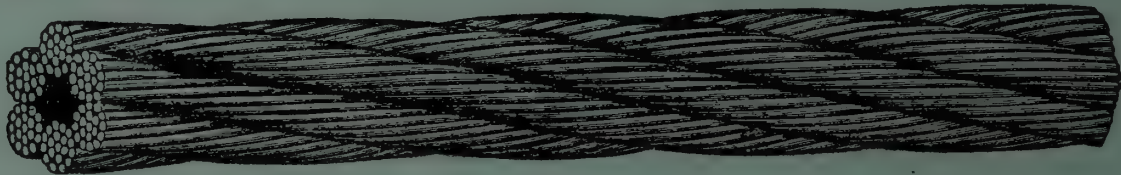
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard  
IMMEDIATE SHIPMENT.

LIGHT MINING RAILS  
12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
..IN STOCK..

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

CATALOGUE  
ON  
APPLICATION

# JAMES COOPER

Office : 299 ST. JAMES ST., MONTREAL.



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. VII.

OTTAWA, JULY 31st, 1903.

Vol. XXII—No. VII



**THE CANADIAN RAND DRILL CO**  
**SHERBROOKE, QUE.**  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

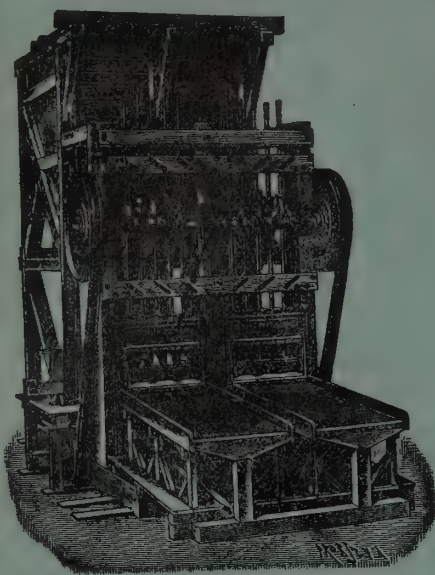
ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

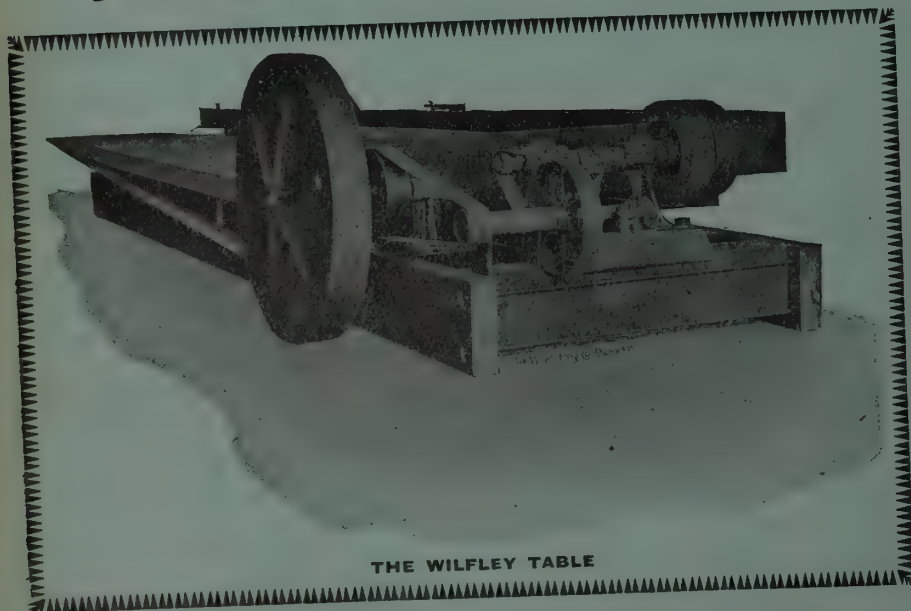
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills, Concentration, Chlorination, Cyanide and Smelter Equipments.



**HADFIELD'S  
PATENT**



**MANGANESE  
STEEL**

Sole Representative of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

**PEACOCK BROTHERS,** Canada Life Building, MONTREAL.

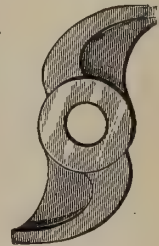
**THOS. FIRTH & SONS, Ltd., Sheffield,**  
**Tool Steel and Rock Drill Steel**  
ALWAYS CARRIED IN STOCK.



**SHOES AND DIES.**



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.

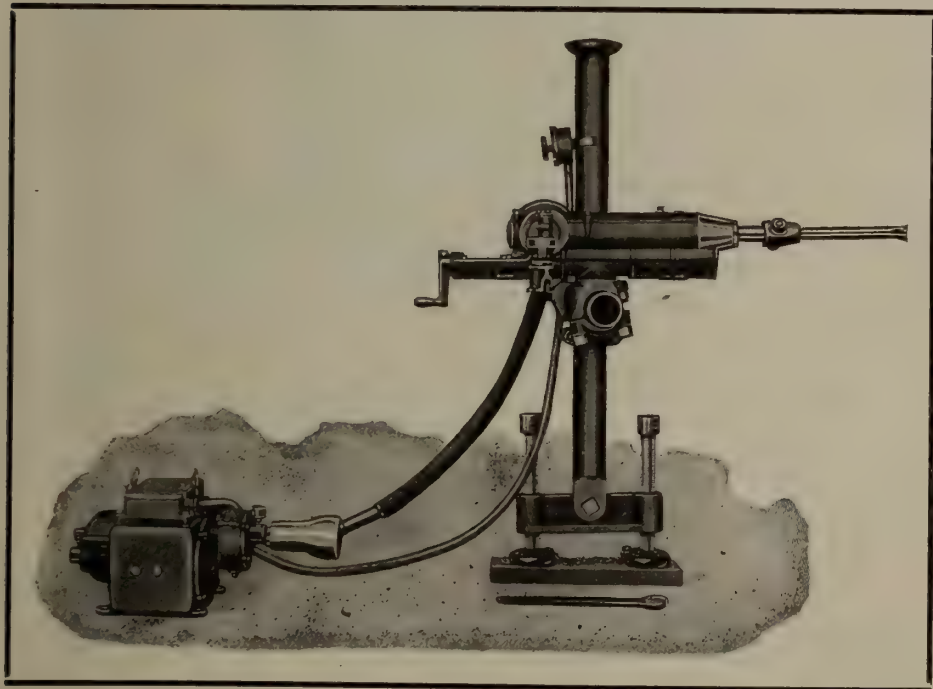


**H. W. DeCOURTENAY & CO.**

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.



**THE GARDNER  
ELECTRIC ROCK DRILL**

A Mechanical Drill Electrically driven.

It requires less Horse Power to operate  
than Air or Steam.

No Pipes to install.

Highest possible efficiency.

Write for descriptive Pamphlets.

They will interest you.

**THE R. E. T. PRINGLE CO. LIMITED**  
**ELECTRICAL APPARATUS AND SUPPLIES**

BRANCH OFFICES:

St. John, N.B. Toronto, Ont.

Head Office and Factory:

**MONTREAL, P.Q.**



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

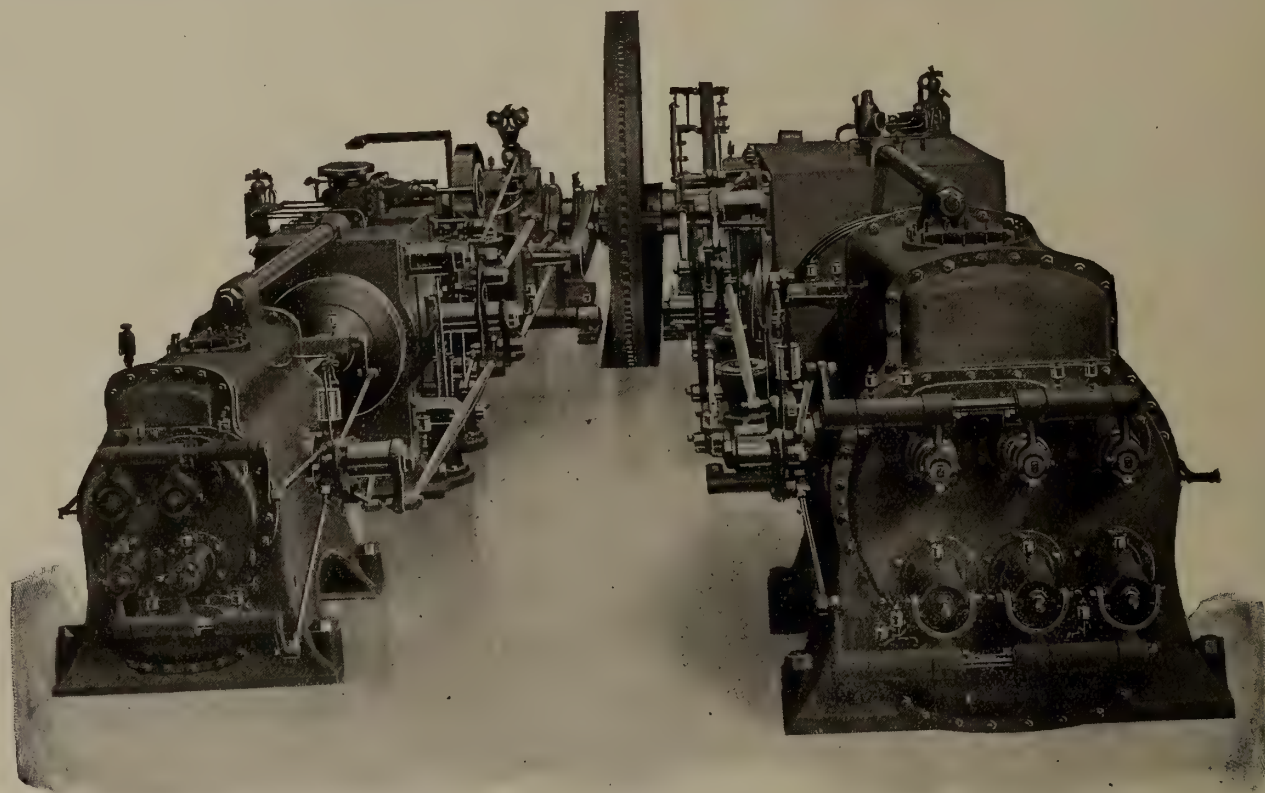
GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

BUILDERS OF

## AIR COMPRESSORS

We build high-grade air compressors for all purposes, and compressors of special design to meet the requirements of mining service. Our compressors are built in two styles, with Riedler mechanically controlled valves, and also with Reynolds automatic valves.



TWO STAGE RIEDLER AIR COMPRESSOR

The above cut illustrates a compressor built for the Anaconda Copper Mining Company, Montana, and the Broken Hill Proprietary Co., Australia, capacity about 7,100 cubic feet free air per minute.

We make a specialty of compressors arranged to be driven either by steam or electricity. We also build three and four stage compressors for unusually high delivery pressure.

We are the largest builders in the world of blowing engines for metallurgical purposes, and there are in constant operation to-day more than 200 large blowing engines of our manufacture.

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

GENERAL

CHICAGO,



OFFICE

ILL., U.S.A.

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennes Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

BUILDERS OF

## SMELTING MACHINERY



We illustrate herewith a 44 by 144 inch steel water jacketed lead smelting furnace, of the latest and most improved design.

We have furnished four of these furnaces for the Compania Metalurgica de Torreon, Coahuila, Mexico. The Allis-Chalmers Company are recognized as the most extensive builders of mining machinery in the world, and their shops are especially equipped for the economical production of copper and lead smelting machinery.

We build copper and lead smelting plants, copper converters, water jackets, hydraulic accumulators, hydraulic cars, slag pots, etc.

SOLE BUILDERS OF

**Riedler Air Compressors  
and Mine Pumps**

**SEDERHOLM and  
REYNOLDS BOILERS**

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

GENERAL

**CHICAGO,**

LONDON, ENG., 533 Salisbury House



OFFICE

**ILL., U.S.A.**

JOHANNESBURG, South Africa

### BRANCH OFFICES:

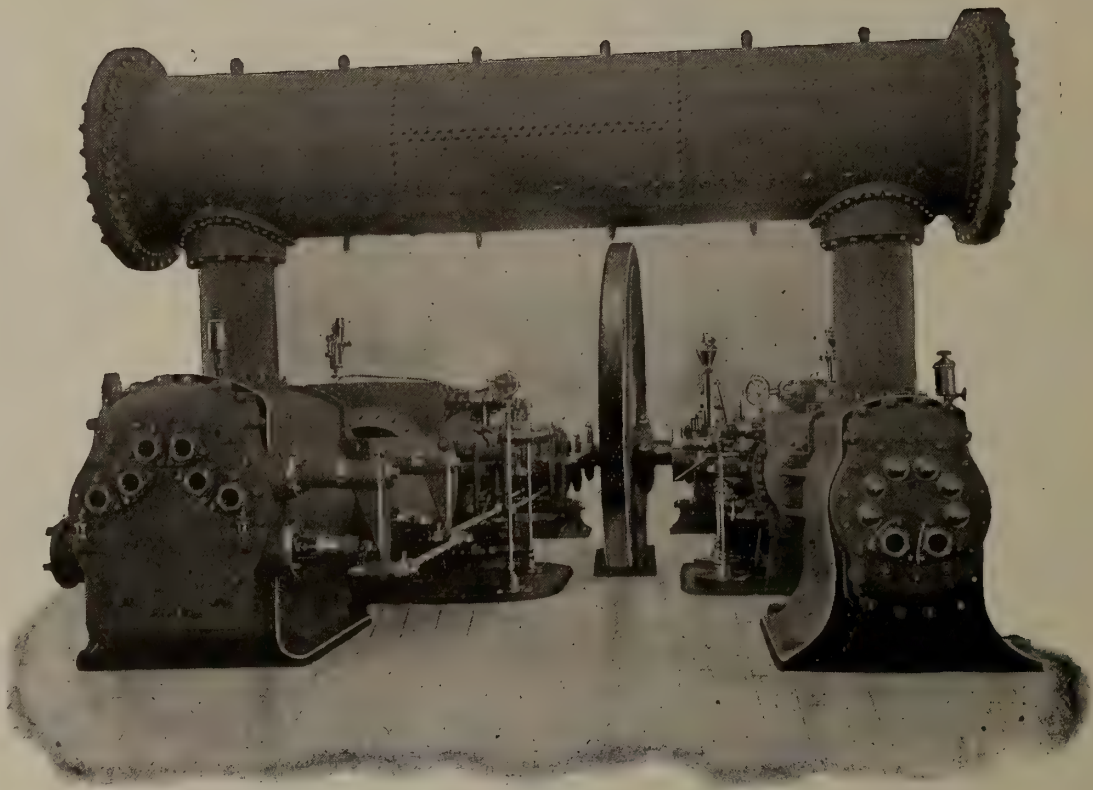
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

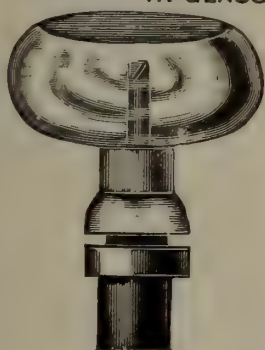
MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-  
ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.

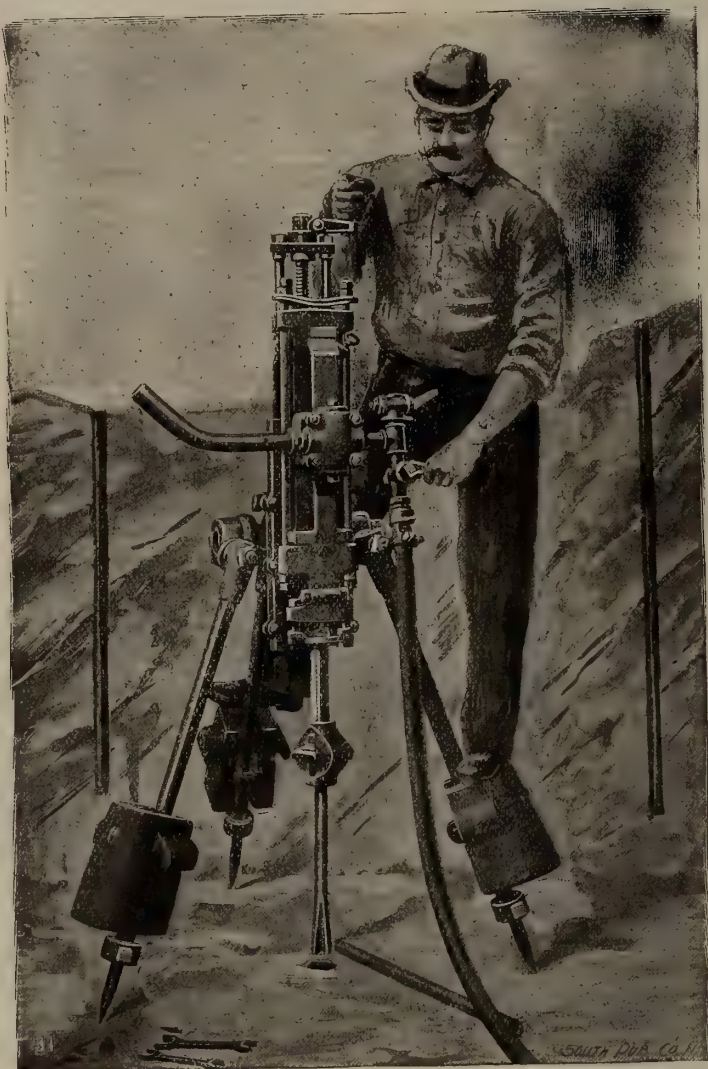


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

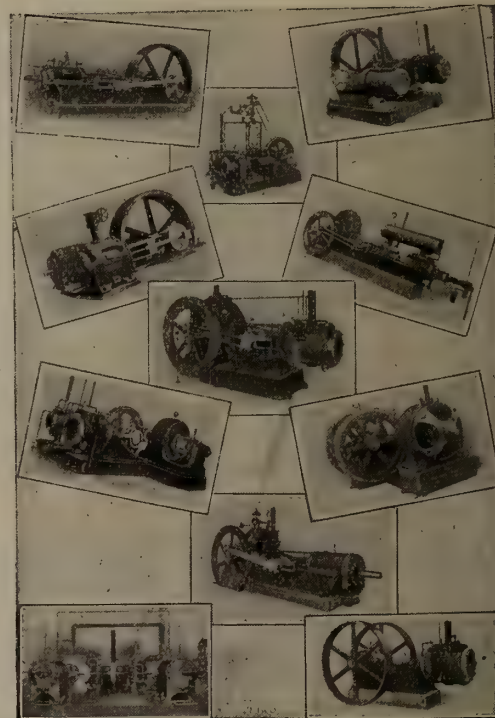
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



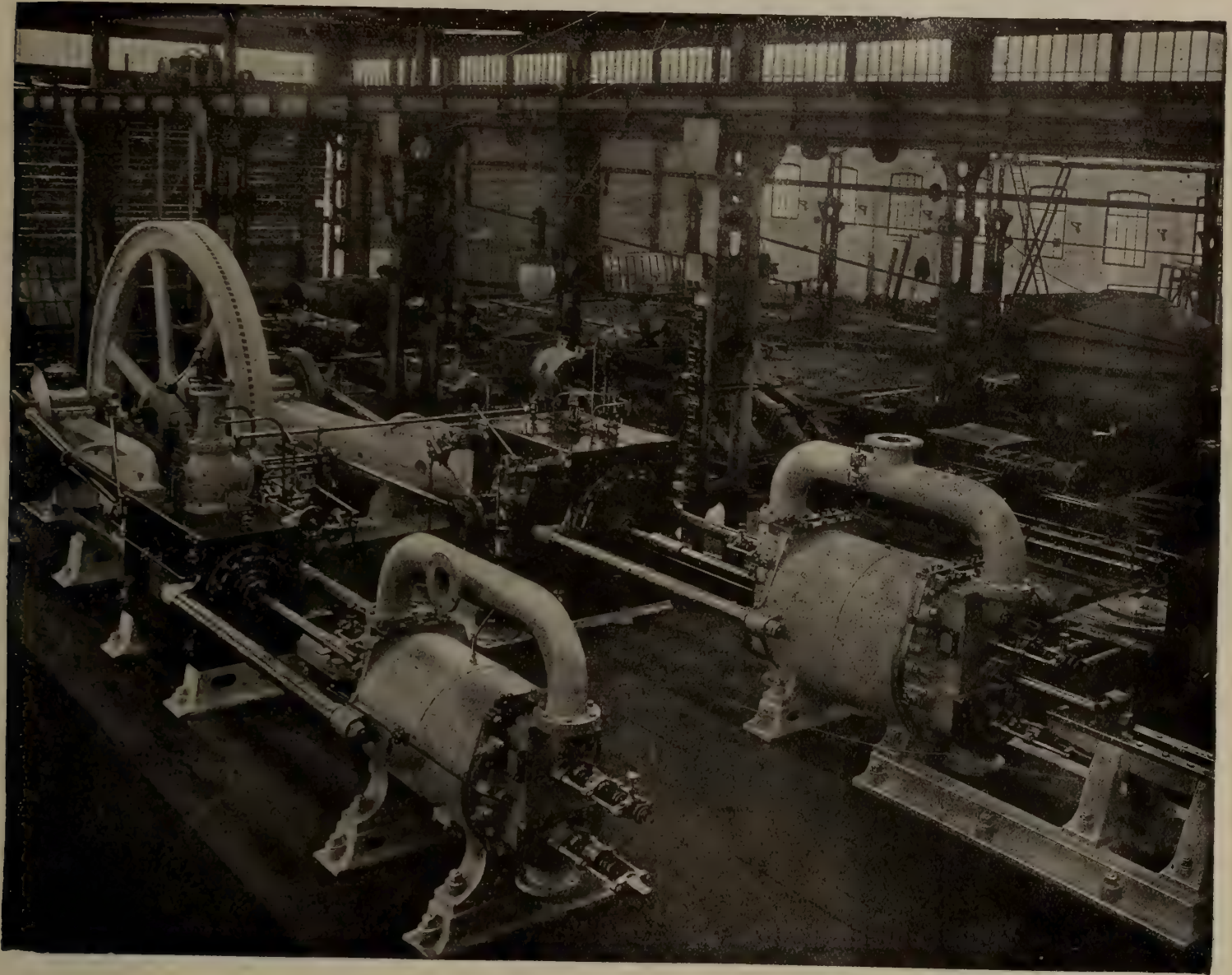


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIR,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you. We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

••••• WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C

Full information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

### J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

## CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

**Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.**

---

**COLLIERIES AT SYDNEY MINES, CAPE BRETON.**

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
**FOR MINING PURPOSES**

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{2}{1000}$  part of One Inch.*

---

**A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.**

**Special Attention Paid to Miners' Requirements.**

**CORRESPONDENCE SOLICITED.**

---

**Steel Works and Head Office : NEW GLASGOW, N.S.**



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# Sullivan Straight Line Two Stage Compressors.

Simple.

Efficient.

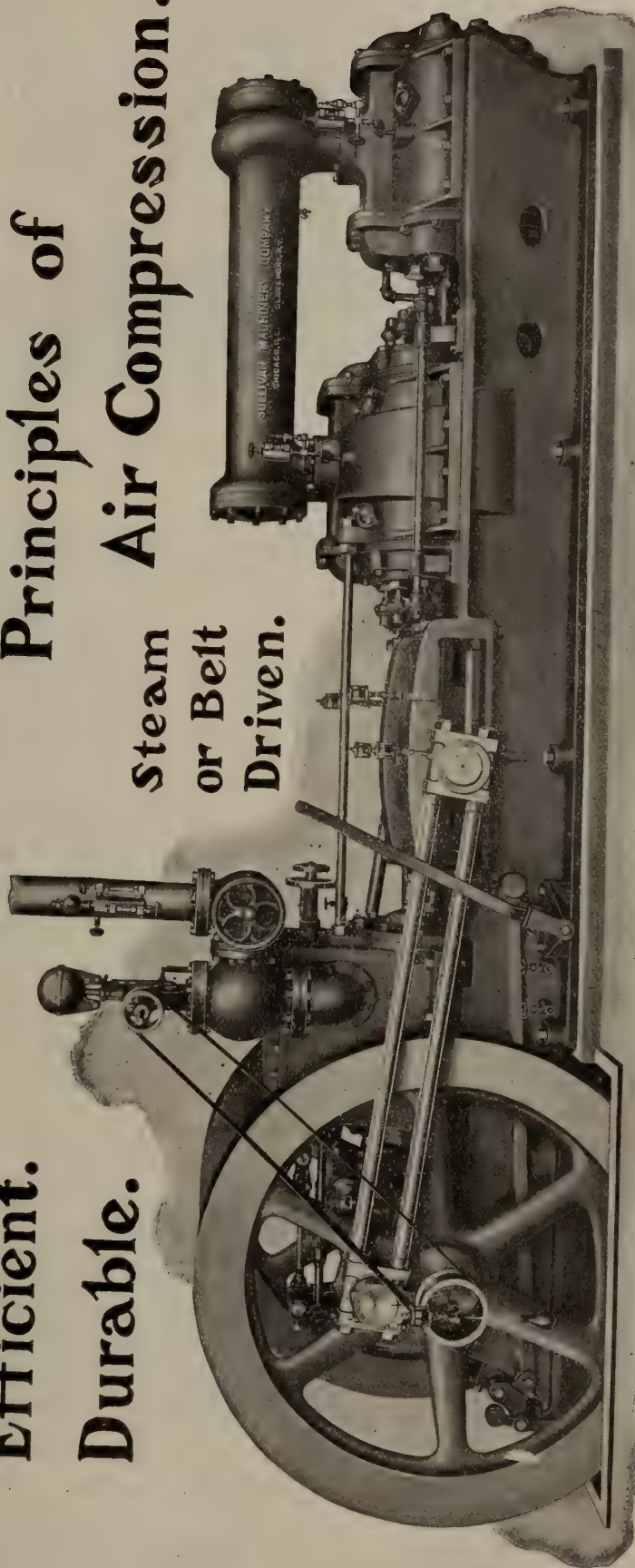
Durable.

Embody the Best

Principles of

Air Compression.

Steam  
or Belt  
Driven.



**Sullivan**

**Machinery**

**Company.**

Claremont, N.H.  
New York.  
Pittsburg, Pa.

135 Adams St.

Chicago, Ill., U.S.A.

European Agency 25 Rue Raffet, Paris

St. Louis, Mo.  
Denver, Colo.  
El Paso, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence

in Bituminous Coal and Coke

for Blast Furnaces, Foundries,

Manufacturing and Domestic

Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office : MONTREAL, Que.

**JAS. P. CLEGHORN,**  
President.

**CHARLES FERGIE,**  
Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

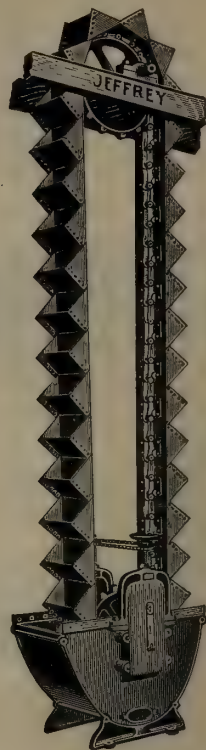
COAL CUTTERS

Power Drills

Screens

Crushers

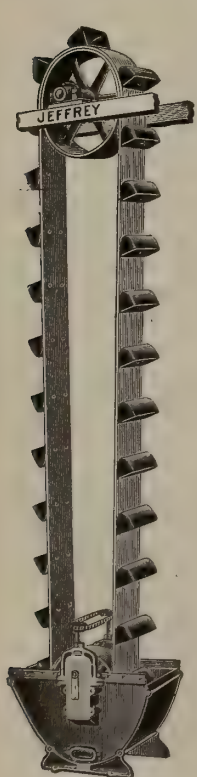
Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address **The Jeffrey Manufacturing Company**

Columbus, Ohio, U.S.A.  
41 Dey St., New York.



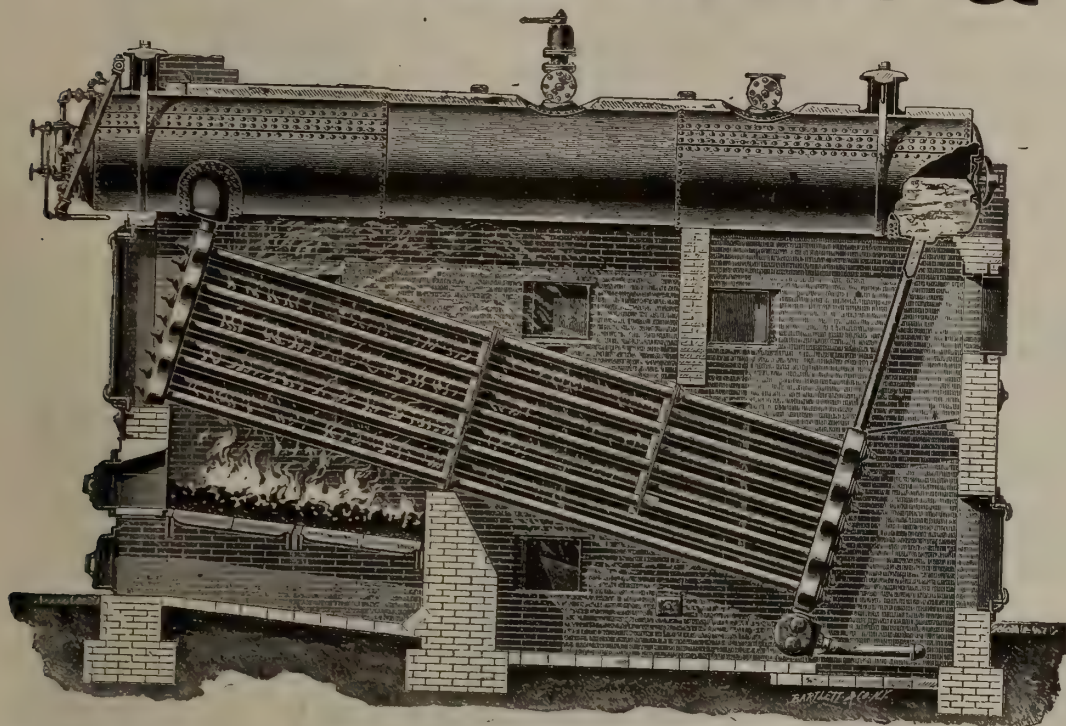
**WILLIAMS & WILSON**  
MONTREAL AGENTS

NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



**WATER TUBE  
STEAM...  
BOILER..**

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**  
HEAD OFFICE FOR CANADA:  
NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL  
**Caledonian Iron Works Co. Limited**  
**MONTREAL, Que.**

**BOILERS** TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY  
GEARS, PULLEYS, HANGERS  
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

**WORTHINGTON PUMPS**

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# Electric Blasting Apparatus.



Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

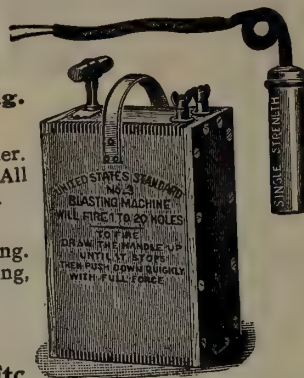
The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.



MANUFACTURED  
ONLY BY

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

SEND FOR  
CATALOGUE

# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

# DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

# ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

**ONTARIO POWDER CO. Limited**

176 ONTARIO STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P.Q.

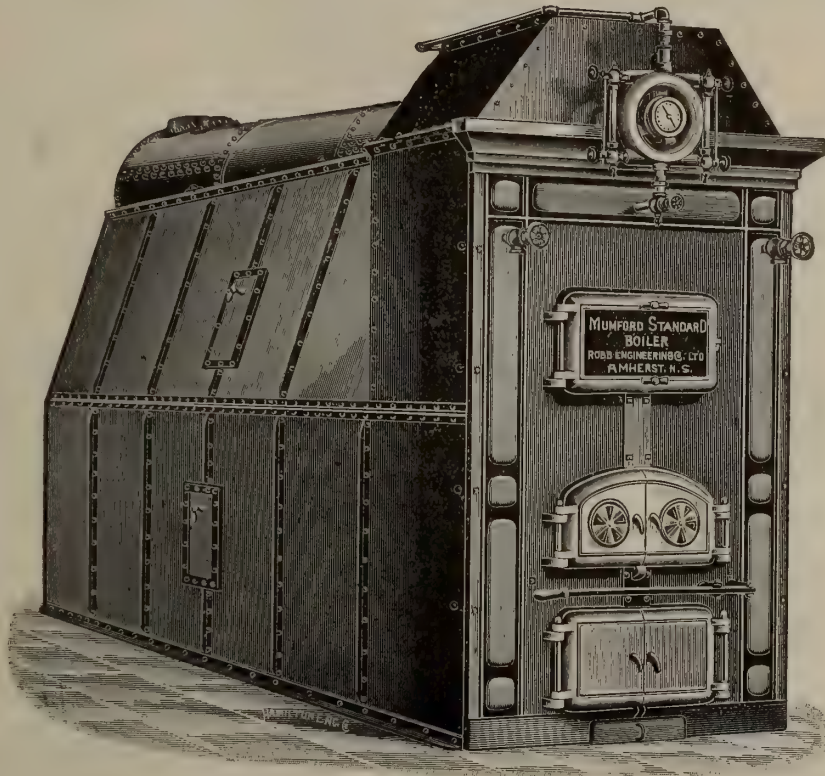
# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works.. **OTTAWA**



# A Decided Difference in the Coal Bill...



By using the MUMFORD STANDARD BOILER instead of a return tubular there will be a reduction in the coal bill of 10 to 25 per cent.

If you require a boiler it will pay you to consider the merits of the Mumford. Catalogues with full particulars will be sent on application.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**AGENTS :** WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

#### 1. THREE YEARS' COURSE FOR A DIPLOMA IN

- (a) Mining Engineering.
- (b) Analytical Chemistry and Assaying.

#### 2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN

##### GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

##### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

##### GROUP III.

- (h) Biology and Public Health.

#### 3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY

for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

#### 4. POST-GRADUATE COURSE FOR THE DEGREE OF

Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
Sept. 30th, 1903.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

1903

THIRTEENTH  
YEAR

BY

B. T. A. BELL

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

A Complete

Directory

to all

Canadian

Collieries

Blast Furnaces

Mines

Quarries

Mills

Smelters

and

Mineral

Producers

Endorsed

by the

Canadian

Mining

Profession

Authentic

Information

Concerning

their

History

Organization

Capital

Dividends

Accounts

Operations

Statistics

Plants

Labour

Approved

by the

Mining

Financial

Press

This standard work of reference to Canadian Mining under-taking and active industries is now printing and will be issued in July.

## A COMPLETE MINING DIRECTORY

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces

For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

Subscribe  
for it.

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

Advertize  
in it.



LOBNITZ GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

**LOBNITZ & CO., LIMITED,**  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.

**GOLD DREDGERS.**

ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

**WILL WORK IN ANY POSITION, IN ANY ROCK.**

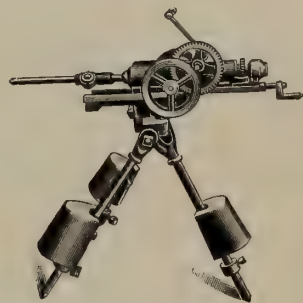
**It Saves Steel,**

**It Saves Labor,**

**It Saves Money.**



Write for Catalogue.



**JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.**

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

**L. B. STEWART, Secretary.**

# THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

## STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING  
ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

## Canadian Mining Manual and Mining Companies Year Book

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL

FOR  
NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CABLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building  
16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE

ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**  
CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel      Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**  
CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**

28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON . . . YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc.** (McGill)

CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street      MONTREAL

**ASSAYS OF ORES.**

CHEMICAL, AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**  
CIVIL AND MINING ENGINEER  
30 Years Experience.

RAT PORTAGE . . . ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.

Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.

**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.

Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.

**FRANK B. SMITH, B.Sc.**

CIVIL AND  
MINING ENGINEER

Certificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**

MINING  
ENGINEER

No. 45 Broadway

NEW YORK

Office, Room 83.

**JOHN ASHWORTH**  
CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**

Civil and Mining  
Engineers.

Surveyors and  
Valuers.

8-KING STREET-8

MANCHESTER, ENGLAND.

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation.      Reports.      Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.

**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.

**J. C. GWILLIM, B.Sc.**

MINING  
ENGINEER

KINGSTON . . . B.C.

**JOHN McAREE, B.A. Sc.**

MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE . . . ONTARIO.

**DeMOREST & SILVESTER**

CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
[Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**  
MINING ENGINEER.

Consultation.      Reports.      Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

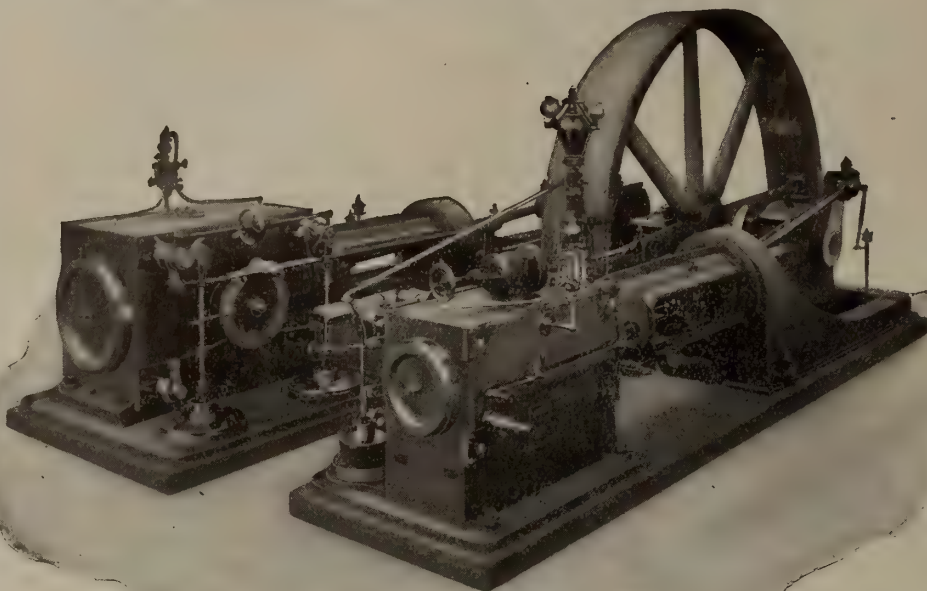
GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

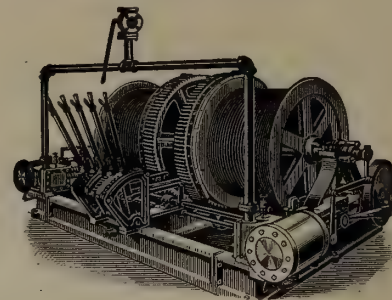
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS. Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# WIRE ROPE

All kinds and sizes, and for all purposes.

Standard and Lang's Patent Lay.

PRICES RIGHT. PROMPT SHIPMENTS.

**The B. Greening Wire Co. Limited**

HAMILTON, ONT.

MONTREAL, QUE.

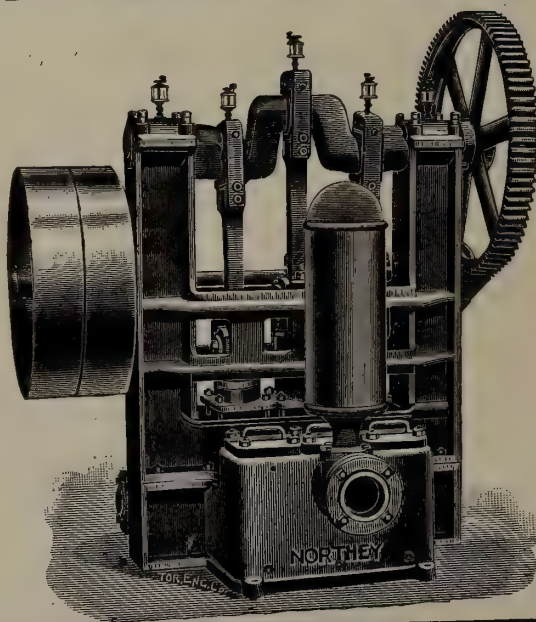
## Pumps for Mine Work

**Triplex Power Pump . . . . .**

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN  
THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 7.

JULY, 1903.

VOL. XXII., No. 7.

## Our Iron and Steel Industries.

Our iron and steel industries can be expected to reach much larger dimensions within the next ten years. It is well within the mark to say that Canada will build more miles of railway within that time than any other country. There will be a very large consumption of steel rails, car wheels and other material which, even if our manufacturers furnish only a comparatively small part of it, should make us take a prominent position as an iron producing country.

Under present conditions, however, it can hardly be expected that this increased production of metal will benefit our iron miners to any great extent. This is evident from the effect which the blast furnace industry, which has been in operation seven or eight years, has had on the iron mines of Ontario. In the eastern part of the Province there are deposits of ore similar in character to those which are being continuously worked in New York and others of the Eastern States. These Ontario deposits are, with one exception, lying idle. If the duty of forty cents a ton on iron ore entering the United States were removed, these Eastern Ontario deposits would be worked. Their output would be shipped across Lake Ontario to enter into competition with ores of similar character which are mined in the Eastern States. Our furnaces being few and small in size use little of this eastern ore which is suitable for mixing with the softer ores of Lake Superior. Iron ores of all kinds from the United States come into Canada duty free and, in Ontario at least, they displace ores of domestic origin. Two or three of the four Ontario furnaces are believed to be interested in iron deposits in the United States and thus have little object in attempting to develop mines in Canada. The great iron ranges of Michigan and Minnesota have numerous deposits which are well opened up. Hence the Ontario consumers of ore are enabled to get cheap supplies without giving any attention to the development of mines. Unless the bounties on iron produced from domestic ores are extended beyond 1907, or conditions are otherwise equalized either by the United States taking off their import duty on ore, or by Canada imposing a similar one, there will be little encouragement for the development of iron mines in this country.

Recent press despatches state that the United States Steel Corporation is seriously thinking of erecting a large plant at one of the ports on the Canadian side of Lake Erie. Ore from the Michigan and Minnesota ranges can be laid down at the same cost at these ports as at any of the ports on the south side of the lake to which it is now shipped. Instead of hauling ore from the lake ports to Pittsburgh, coke will have to be brought to the smelters on the north shore.

As regards shipment of manufactured material to Europe, the ports on the north shore of Lake Erie would seem to be as well situated as is Pittsburg. Steamers, loaded with steel rails in Germany for the Canadian Northern Railway have arrived at Port Arthur during the present season. And of course if the European market demands it rails can be shipped as well down the St. Lawrence route as up it. It would seem, however, that for the next ten years or so the Canadian market will consume all the output of the plants now in existence or which are likely to be erected in this country during that time.

In connection with this invasion of Canada by the Steel Corporation as manufacturers, it is of interest to know that the Corporation has since its organization been gradually getting control of the raw materials of the Lake Superior ranges and now controls a high percentage of the ore reserves. The Corporation also already controls a considerable area of the most promising iron lands of Northern Ontario, which possess characteristics similar to those of the developed Lake Superior ranges. It has been feared in Ontario that these lands of the Province were being gotten under control by the Corporation in order, not to develop them, but to hold them in reserve and prevent their falling into the hands of competitors. Under the present Provincial regulations the Government has the power to compel the mining of at least 2,000 tons per annum on every 40 acre iron claim located within the last few years. It is not likely it will ever be necessary to exercise this power, now that the Corporation has decided to manufacture on a large scale in the Province. It would be a very unpopular act for any corporation to seek to tie up the iron ore supply of the Province, without developing some, at least, of the deposits, and judging from the operations of the Steel Corporation on the Mesabi and other ranges they consider it poor policy to run counter to public opinion. They own the railways on these ranges in addition to controlling most of the mines and the public have nothing of which to complain. Good train service is given and a liberal and progressive policy is followed in the management of the mines. Knowing this, we have every reason to give the Corporation a cordial welcome to this side of the line.

The Corporation having its mines, both coal and iron, already developed, its fleet of ore boats well organized and, moreover, having an experienced technical staff upon which to draw is much more likely to make a success of the industry than is a group of mere promoters, such as some of those which we unfortunately know too well in connection with mining and metallurgical enterprise in this country.

If the Corporation do not manufacture steel rails and other railway supplies in Ontario they will have to pay more for the carriage



of their materials to those parts of the line of railway where they are to be used. At any of our Ontario ports the rails can be loaded directly on to boats for Port Arthur and other points, while shipping from Pittsburg and other places south of the lake there is extra handling. Duty and bounty have also to be taken into consideration.

Cars of coke arriving at a Lake Erie port can be ferried across the lake in the way that coal cars have been carried for some years by the Grand Trunk Railway from Erie to Port Dover. Instead of hauling, say one and two-thirds tons of 60 per cent. iron ore to Pittsburg from Lake Erie, one ton of coke will be hauled from Pittsburg to the Canadian shore.

It may also be noted that without a plant in Canada the Steel Corporation will not be in a position to get a share of the bounties on wire rods which the Dominion Government have recently decided to grant. By having a plant in this country much more of the ore from the Corporation's mines will enter into the various manufactured forms of iron than it would otherwise would, and its only two serious rivals, Germany and Great Britain, having both bounties and duties, on some material, against them, will be placed at a great disadvantage in competing for the large amount of railway and other supplies which will be consumed in this country during the next few years. The Steel Corporation has a larger output than have all the iron manufacturers of Great Britain combined.

German iron manufactures on a large scale are comparatively new comers to our market, but the volume of the exports from that country has recently greatly increased despite the growth of the trade between the Dominion and the United States. In 1902 German exports to Canada under the head of iron and steel amounted to 65,405 tons, which is an increase of 34,993 tons, or over 100 per cent. on the exports for the previous year. This is a large business and the rapid rate of its recent growth, together with the knowledge that the consumption of iron is to greatly increase in this country through railway building, has naturally induced the United States Steel Corporation to consider the building of a plant in Ontario where they will have important advantages over their foreign competitors.

### Mining Progress in Nova Scotia.

During the past few months the interest in Dominion Iron and Steel stocks might suggest a falling off in mining development in Nova Scotia. Fortunately, outside of the speculative section, there is a well grounded belief in the future of iron and steel in the province, and in its coal, gold, etc.

The damage caused by the fire in the No. 1 colliery of the Dominion Coal Company is being gradually rectified, and it is to be hoped that the management will profit by the lesson. A fire arising from a similar cause at the Joggins mines was promptly extinguished. The future interests of the country would be benefited to the lay mind if no open lights, etc., were allowed in coal mines. All the coal mines are working steadily, and the Pictou and Cumberland districts are benefiting by the re-opening of the Londonderry iron plant, which draws its coal and coke supplies from these two districts.

Arrangements are being completed for prospecting the district lying between Springhill and Apple River by the aid of the Government calyx drills. In Colchester county a company has opened a seam of coal near Debert Station, and is preparing to connect it with the Intercolonial Railway.

A mine at this point, only three miles from the Intercolonial Railway, will command the Truro, Halifax, and Annapolis Valley trade, and if the coal proves on trial to possess coking properties the Londonderry furnaces will have a fuel almost at their doors.

The explorations carried on between New Glasgow and Pictou

were hampered by difficulties met in penetrating the carboniferous conglomerates overlying the coal measures. The rock, compact near the surface, became too soft to permit of drilling at a depth of a few hundred feet. This conglomerate is now being bored by a cutting drill, and tubed, when boring will be resumed by the Government calyx drill in the coal measures.

An attempt to find coal on the southern side of this coal field has not yet proved successful. In fact, experts have pronounced the locality to be outside the coal field.

In Cape Breton county some American and Canadian capitalists are reported to have purchased the New Campbellton Colliery and a number of other areas. In the district lying between Mira Bay and Sydney, long classified as unproductive, the energy of the late Mr. Moseley opened a six feet seam of coal. This seam has been acquired by the Cape Breton Coal Exploration and Development Company, together with a number of others, in all about 30 square miles of coal land.

This company, organized in New York, has begun the work of opening their property, and has given large contracts for the equipment of their mine with electric haulage, power, etc. The development of this company is being watched with interest as they may prove a most formidable rival to the Dominion Coal Co., and to the Nova Scotia Steel and Coal, working the old Sydney mines.

The work of exploration in the Richmond coal fields which would, it was hoped, have had the effect of showing its structure, etc. is arrested pending a rearrangement of title.

In the gold mines there is little of interest to report. The Evan Thompson mine at Renfrew, which attracted attention some time ago by rich returns, is under option to parties at a price it is said of \$165,000 00. The Dolliver Mountain Company are nearly through with their preliminary work. Should their anticipations be realized, they will have a low grade mine capable of handling several millions of tons of ore at a good profit. A few other properties are working steadily, but no new discoveries are reported. Gold mining in Nova Scotia is passing through the stage intermediate between that of the small rich veins and that of large deposits of low grade ore. While the former will continue for years to attract the attention of local miners, the latter will, as their merits become better known, fall to the capitalists.

It will be remembered that at the last session of the Legislature a large sum of money was voted to assist in furnishing the sinking of deep shafts in the gold fields. At present only in the Caribou and Queens districts are there workings exceeding in depth 500 feet, the point at which the Government subsidy becomes available. As yet no steps have been taken to carry the Act into effect, but an application is expected from the Caribou district where all the workings have reached a depth of about 800 feet.

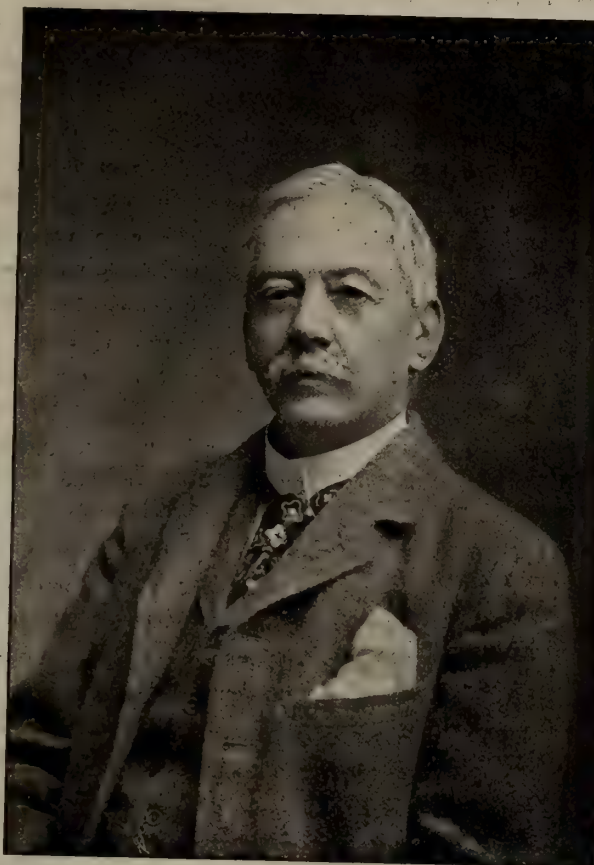
The Torbrook iron mine at Nictaux has recommenced working, and is making shipments to Londonderry furnaces, where the testing of the old iron mines is making satisfactory progress.

Halifax parties who have for some time studied the Cheticamp district in Northern Inverness, report finding large deposits of copper ore. It is claimed that these are of workable value in addition to their gold and silver values.

These hopes appear to be well founded, and they are adopting the proper course of determining their underground values first, instead of, as is too often the case, building concentrators, smelters, etc., and then starting to see what kind of a mine they have.

The Silica Brick Company of North Sydney have started to manufacture brick, which is reported as satisfactory in quality. Several steamer loads of selenite and crystallized plaster have been shipped from the vicinity of Halifax to the United States. It is stated that this higher grade of gypsum is used for filling paper in place of talc, etc.





THE LATE JAMES COOPER, MONTREAL,  
PRESIDENT OF THE JAMES COOPER MFG. CO. AND THE DOMINION WIRE ROPE CO.



## EN PASSANT.

We record this month the death of Mr. James Cooper with sincere sorrow. While Mr. Cooper held mining interests in different parts of this country, and in the early days was a prominent figure in the phosphate industry, it was as the head of the large mining machinery establishment of the James Cooper Manufacturing Company and its sister corporation, the Dominion Wire Rope Company, that he was most widely known and esteemed throughout the country. Mr. Cooper had been ill about three weeks. By his death the REVIEW loses one of its oldest and best friends.

In accordance with an almost unanimous vote of the Council the Library and Reading Room of the Canadian Mining Institute has been removed from the Windsor Hotel, Montreal, to Orme's Building Wellington Street, Ottawa, where in future it will be under the immediate direction of the secretary. The new location is readily accessible, facing the Parliament Buildings, and the premises are sufficiently large to meet the growth of the collection for many years to come. The library will be open to the public every week day from 9 to 5, and has been fitted up specially for the use, not only of mining men, but any one seeking information concerning the resources and mining industries of the country. The collection now numbers over 2,000 works of reference, and a complete record is kept of all active Canadian mining undertakings.

Vol. VI. of the Journal of the Canadian Mining Institute, which was destroyed by fire, is being reset, and it is hoped will be ready for distribution about the 1st of October. It is a large volume, containing some forty papers contributed by the members, and will be handsomely illustrated and bound.

The following is the text of the new lead and iron and steel bounties which are to come up for discussion in Parliament this month:—

That it is expedient to repeal Chapter 8 of the Statutes of 1901 intituled: "An Act to provide for the payment of bounties on Lead refined in Canada," and to enact as follows:—

1. The Governor-in-Council may authorize the payment of a bounty of seventy-five cents per one hundred pounds on lead contained in lead-bearing ores mined in Canada; such bounty to be paid to the producer or vendor of such ores, upon evidence that such ores have been smelted in Canada. Provided, that the sum to be paid as such bounty shall not exceed five hundred thousand dollars in any fiscal year. Provided, also, that when it appears to the satisfaction of the minister charged with the administration of this Act that the standard price of pig lead in London, England, exceeds twelve pounds ten shillings sterling per ton of two thousand two hundred and forty pounds, such bounty shall be reduced proportionately by the amount of such excess.

2. Payment of the said bounty may be made from time to time to the extent of sixty per centum of the full bounty authorized, subject to adjustment at the close of each fiscal year. If at the close of any year it shall appear that during the year the quantity of lead produced, on which the bounty is authorized, exceeds thirty-three thousand three hundred and thirty-three tons of two thousand pounds, the rate of bounty shall be reduced to such sum as will bring the payments for the year within the limit mentioned in section one.

3. If at any time it shall appear to the satisfaction of the Governor-in-Council that the charges for transportation and treatment of

lead ores in Canada are excessive, or that there is any discrimination which prevents the smelting of such ores in Canada on fair and reasonable terms, the Governor-in-Council may authorize the payment of bounty at such reduced rate as may be deemed just, on the lead contained in such ores mined in Canada and exported for treatment abroad.

4. The said bounties shall cease and determine on the thirtieth day of June, one thousand nine hundred and eight.

5. The Governor-in-Council may make regulations for carrying out the intention of this Act.

Commenting on the lead duties, Mr. J. L. Parker, M.E., in charge of the North Star mine, at Kimberley, B.C., writes:—

As long as the bonus last, we may consider that we will have good times, for the following reasons:—

1st. The mines that are in a shipping condition, but which are not shipping, will naturally ship their ores.

2nd. Those in a developing condition, but not developing, will naturally develop.

3rd. Those properties which have a favorable surface mineral condition, will naturally either have some work done on them, or the owners will find a more favorable market for them than has been the case the past two years.

4th. Encouragement will be given the prospector to hunt for new finds, probably resulting in the later opening up a new district or two.

5th. The wage expenditure will return to the old standard of about \$2,500,000 per annum instead of less than \$500,000.

6th. The merchants, who have been reducing their stock, will replenish it, resulting in the merchants east getting fresh orders, and giving the railroads more work.

7th. The smelters will have live furnaces, instead of dead ones, and this will give employment to more men, and through this certain ores available for fluxes can be used and purchased by them which would otherwise have to remain in the ground. This latter feature is an important one, giving employment to more men.

The amount of bonus to be distributed in five years time on the basis of \$15 per ton, will be about \$2,500,000, and as the mine owners will spend \$10,000,000 more during the same period, than they would have done under the past bad conditions, it will be seen that the Government aid, although tardy, will mean a direct aid to the district of \$2,500,000 besides an indirect aid to the amount of \$10,000,000.

The following will be the amounts of bonus on the different grades of ore that each grade will earn:—

- 30 per cent. lead ore, \$4.05 per ton.
- 40 per cent. lead ore, \$5.40 per ton.
- 50 per cent. lead ore, \$6.75 per ton.
- 60 per cent. lead ore, \$8.10 per ton.

On iron and steel the following:—

(a) On rolled, round wire rods not over three-eighths of an inch in diameter, when sold to wire manufacturers for use in making wire in their own factories in Canada, a bounty of six dollars per ton;

(b) On rolled angles, tees, channels, beams, joists, girders, or bridge, building or structural rolled sections, and on other rolled shapes not round, oval, square or flat, weighing not less than thirty-five pounds per lineal yard, and also on flat eye bar blanks, when sold for consumption in Canada, a bounty of three dollars per ton;

(c) On rolled plates not less than thirty inches in width and not less than one-quarter of an inch in thickness, when sold for consumption in Canada for manufacturing purposes for which such plates are usually required and not to include plates to be sheared into plates of less width, a bounty of three dollars per ton.



2. The Governor-in-Council may make regulations to carry out the intentions of the foregoing section.

3. That Chapter 8 of the Statutes of 1899 be so amended as to provide that the bounties on steel and iron authorized by Chapter 6 of the Statutes of 1897 shall be continued until the thirtieth day of June, one thousand nine hundred and seven, and that the rates of such bounties shall be as follows:—

(a) From the first day of July, one thousand nine hundred and three to the thirtieth day of June, one thousand nine hundred and four, both inclusive, the bounties shall be ninety per centum of the amount fixed by the said Chapter 6 of the Statutes of 1897;

(b) From the first day of July, one thousand nine hundred and four, to the thirtieth day of June, one thousand nine hundred and five, both inclusive, the bounties shall be seventy-five per centum of the amount fixed by the said Chapter;

(c) From the first day of July, one thousand nine hundred and five, to the thirtieth day of June, one thousand nine hundred and six, both inclusive, the bounties shall be fifty-five per centum of the amount fixed by the said Chapter.

(d) From the first day of July, one thousand nine hundred and six, to the thirtieth day of June, one thousand nine hundred and seven, both inclusive, the bounties shall be thirty-five per centum of the amount fixed by the said Chapter.

#### Imports of Mining Machinery.

The imports of free and dutiable mining and smelting machinery for the first five months of the present year compared with 1902, are as follows:—

| MONTHS         | 1903      |          |          | 1902    |          |         |
|----------------|-----------|----------|----------|---------|----------|---------|
|                | Free      | Dutiable | Total    | Free    | Dutiable | Total   |
| January .....  | \$ 77,298 | \$ 7,676 | \$84,974 | 92,984  | 2,549    | 95,533  |
| February ..... | 30,106    | 1,587    | 31,693   | 43,123  | 2,380    | 45,503  |
| March .....    | 83,535    | 11,534   | 95,069   | 55,255  | 2,629    | 57,884  |
| April .....    | 104,967   | 4,638    | 109,605  | 61,227  | 5,087    | 66,314  |
| May .....      | 155,493   | 1,469    | 156,962  | 90,820  | 4,782    | 95,602  |
| Total .....    | 451,399   | 26,904   | 478,303  | 343,409 | 17,427   | 360,836 |

The principal sources from which this machinery has been imported were:—

| MONTHS         | UNITED STATES |          | GREAT BRITAIN |          | Other Countries | TOTAL    |
|----------------|---------------|----------|---------------|----------|-----------------|----------|
|                | Free          | Dutiable | Free          | Dutiable |                 |          |
| January .....  | \$75,235      | \$ 7,676 | \$ 417        | —        | \$1,646         | \$84,974 |
| February ..... | 29,467        | 1,587    | 639           | —        | Nil             | 31,693   |
| March .....    | 82,680        | 11,534   | 158           | —        | 697             | 95,069   |
| April .....    | 104,902       | 4,638    | 65            | —        | Nil             | 109,605  |
| May .....      | 155,127       | 1,263    | 366           | 206      | "               | 156,962  |
| Total .....    | 447,411       | 26,698   | 1,645         | 206      | 2,343           | 478,303  |

#### The Tyee Smelter.

Mr. Thomas Kiddie, manager of the smelting department of the Tyee Copper Company, contributes to the last issued report of this company the following description of the smelting plant installed at Ladysmith, Mount Sicker District of British Columbia. The plant was designed by Mr. Kiddie.

The site is admirably adapted for a smelting plant, lying between the Esquimalt and Nanaimo Railway track and Oyster Bay, 84 ft. elevation above high water mark. In section, the works are located as follows:—Converter floor, 31 ft.; furnace room floor, 37 ft.; charging floor, 51 ft.; top of burnt ore bins, 68 ft.; bottom of burnt ore cuttings at roast yard, 68 ft.; roast yard floor, 72 ft.; top of permanent trestles through roast yard, 80 ft.; top of ore bins, 100 ft. above high water mark. In order to utilize the ground at the Roast Yard, it was necessary to elevate the ore bins 16 ft. above the level of Esquimalt and Nanaimo track, to which that company built their approach; the other levels, as given above, gave us the maximum dumpage for slag, viz: 31 ft. Sidings for the delivery of coke and coal to the 51 ft. level, and the delivery of matte to the 37 ft. level were also put in. The railway company also, according to the terms of their contract, supplied all the water necessary for steam power, furnace, and slag-shotting purposes, all of which work was well and promptly done by them.

ROAST YARD.—This was laid out on the 68 ft. level, north, or opposite the ore bins, and connected therewith by a system of tracks running out over the roast yard, carried on permanent trestles, while between each set of trestles travelling bridges serve to distribute the ore over any part of the roast pile. This has worked splendidly, so that our total cost of roasting and delivering the burnt ore to the smelter bins is now 37 cents per ton of burnt ore. The roast yard is connected with the smelter by a surface tramway, operated by horsepower. All the work in this department is done by Chinese, while that at the smelter is done by white labor.

The total capacity of the ground for ore burning is about 7,000 to 8,000 tons per month.

BUILDING OPERATIONS.—We commenced clearing the ground at Ladysmith (which was densely covered with timber) on April 11th, 1902; this was sufficiently advanced to allow grading for the smelter site to start on May 21st, which work was done by contract to our satisfaction. The ground required for a roasting yard was located at the west boundary of the property at Rock Creek, and cleared and graded, and here also the ore-receiving bins were erected, the Esquimalt and Nanaimo Company putting in the siding at their expense. The contract for the smelting and sampling plants, power, &c., was let to the Allis-Chambers Company, Chicago, Ill., and signed on May 4th. The contract for a steel stack 90 ft. by 7 ft. was let to the Vancouver Engineering Works, Vancouver; for a 6-in. water pipe line to McLennan, McFeely & Co., also of Vancouver; while all the lumber was supplied on contract by the Ladysmith Lumber Co., Ltd., Ladysmith; otherwise all the building, brick and rock work, installation of plant, &c., was done by the company in a thorough and workmanlike manner, preference being given to solidity rather than cheapness. As laid out, we have a very complete gravity system throughout the works, while ample provision has been made in each department for future extension in any direction.

MACHINERY AND PLANT.—The furnace, engine, boiler and plant supplied by the Allis-Chalmers Company is of the latest design and first-class in every particular, and so far has given the utmost satisfaction. Owing to strikes at their works, delivery of the plant was very slow, causing much delay in starting up; at the same time it enabled



us to carry on the work of building and installation in a very thorough manner, all of which will tend to better results in the future, and low cost of repairs.

**SMELTER BUILDING.**—The smelter building is framed with 12 in. by 12 in. timbers, while all the foundations are of concrete or stone work. It has ample ventilation and light, and is fitted with fire hose and hydrants, lift, matte cracker and grinder for sampling. Cast iron moulds are used for the matte instead of matte pots, and nearly all of the floor is covered with 1 in. cast iron plates.

**ENGINE AND BOILER ROOM.**—The engine and boiler room is framed on the same lines as the smelter building. The foundations for the Corliss engine and Connorsville blower are of concrete. An electric plant was also installed and all the buildings wired for electric light. A general storeroom has been petitioned off from the boiler room in which all smelter stores and supplies are kept in charge of the engineer on each shift. All steam pipes are covered with pipe covering, and exhaust pipes are carried out underground to the edge of the dump. From the plans submitted, it will be seen that ample space remains in this department for further machinery, when required, while between this and the smelter building we have 60 ft. of ground already excavated.

**ORE BINS.**—The ore bins are all of the best design and workmanship, and fitted with iron ore bin gates for rapid work. Plans of the receiving bins were submitted to the railway company and passed by them. The burnt ore bins at the rear of the smelter building are roofed over, while those at the roast yard are open.

**OTHER BUILDINGS.**—Other buildings erected were a temporary office, blacksmiths' and carpenters' shop. A permanent assay office of four rooms, complete with 30 ft. stack, melting and muffle furnaces, and fitted up with all necessary apparatus for general assaying and analytical work, has been completed, and is in every way a building well suited to the work. A manager's residence was also built near the east boundary of the property; it contains eight rooms and cellar, is wired for electricity, and fitted with bath, etc. Being on the property, it is very convenient for business and equally comfortable.

We have since built a permanent blacksmith and carpenter shop, west of the smelter building, oil house, closets and powder house, and generally much finishing work has been completed.

**ORE RECEIPTS.**—The ore receipts from September 22nd, 1902, to April 30, 1903, have been as follows:—

|                       |                  |
|-----------------------|------------------|
| Rough Copper Ore..... | 15,060.725 tons. |
| Fine " " .....        | 5,173.785 "      |

a total of 20,234.510 tons of ore, the average assay of which was as follows:—

|                   |                |
|-------------------|----------------|
| Copper (Wet)..... | 4.43 per cent. |
| Silver.....       | 2.76 ozs.      |
| Gold .....        | 0.12 "         |

The average assay for the three months ending January, 1903, was as follows:—

|                    |                |
|--------------------|----------------|
| Copper (Wet) ..... | 4.32 per cent. |
| Silver .....       | 2.71 ozs.      |
| Gold .....         | 0.129 "        |

And for the three months ending April 30th, 1903:—

|                   |                |
|-------------------|----------------|
| Copper (Wet)..... | 5.28 per cent. |
| Silver.....       | 3.21 ozs.      |
| Gold .....        | 0.142 "        |

an increase of copper .96 per cent., silver, 5 oz., and gold .013 oz.

The other receipts were as follows:—

|                         |               |
|-------------------------|---------------|
| Schistose Flux Ore..... | 1,340.90 tons |
| Sandstone.....          | 396 "         |
| Iron .....              | 550.97 "      |
| Coke.....               | 2,346 "       |

**BURNT ORE.**—The average analysis of the burnt ore delivered to the smelter is as follows:—

|            |                 |
|------------|-----------------|
| Iron ..... | 10.44 per cent. |
| Zinc.....  | 8.14 "          |

|                       |         |
|-----------------------|---------|
| Alumina.....          | 3.61 "  |
| Barium Sulphate.....  | 34.08 " |
| Magnesia.....         | Trace.  |
| Lime .....            | 3.46 "  |
| Silica .....          | 22.51 " |
| Combined Sulphur..... | 7.42 "  |
| Total Sulphur.....    | 13.86 " |

During the past three months the burnt ore has shown an increase of:—

|                       |                |
|-----------------------|----------------|
| Iron .....            | 1.86 per cent. |
| Zinc.....             | .93 "          |
| Barium Sulphate.....  | 7.66 "         |
| Lime .....            | .50 "          |
| Sulphur Combined..... | .54 "          |

and a decrease of 11.49 per cent. silica.

**SMELTING OPERATIONS.**—Since the furnace blew in on December 16th, 1902, it has run 107 days of 24 hours each, and smelted as follows:—

|                    |                  |                |                  |
|--------------------|------------------|----------------|------------------|
| Burnt Ore.....     | 13,853.841 tons. | Total Ore..... | 16,091.465 tons. |
| Green ore.....     | 2,237.624 "      |                |                  |
| Schist.....        |                  | 539.636 "      |                  |
| Silica Flux.....   |                  | 774.687 "      |                  |
| Slag.....          |                  | 338.108 "      |                  |
| Iron Ore.....      |                  | 301.653 "      |                  |
| Matte.....         |                  | 963.818 "      |                  |
| Total Mixture..... |                  | 19,009.367 "   |                  |

Coke used..... 2,166.313 long tons.  
showing an average per day of 150.387 tons of ore, and 177.657 tons of mixture. The ratio of coke to ore was one ton of coke to 7.428 tons of ore, and one ton of coke to 8.775 tons of total mixture.

**SLAGS.**—The following is an average assay of the slags produced:—

|                    |                |
|--------------------|----------------|
| Copper .....       | 0.65 per cent. |
| Iron .....         | 15.71 "        |
| Silica .....       | 28.79 "        |
| Alumina .....      | 11.51 "        |
| Zinc Oxide.....    | 10.43 "        |
| Barium Oxide.....  | 30.35 "        |
| Calcium Oxide..... | 3.38 "         |

**PRODUCT.**—The product for the 107 days ending April 30th, 1903, was as follows:—

Matte produced 1,394.3195 tons containing:—

|              |                |
|--------------|----------------|
| Copper ..... | 1,169,896 lbs. |
| Silver ..... | 41,372.78 ozs. |
| Gold .....   | 2,068.398 "    |

Total value, less refining charges only:—

|                            |             |
|----------------------------|-------------|
| Settlements received ..... | \$74,879 60 |
|----------------------------|-------------|

Balance not settled for (estimated):—

|                                        |              |
|----------------------------------------|--------------|
| 717,069 lbs. Copper at 11.5; 24,878.35 |              |
| ozs. Silver at 95 per cent. of 53.5 =  |              |
| 50.82 cents; 1,293.416 ozs. Gold at    |              |
| \$20.00.....                           | 120,974 42   |
|                                        | \$195,854 02 |

Showing an average matte of:—

|                   |                 |
|-------------------|-----------------|
| Copper (Dry)..... | 41.95 per cent. |
| Silver .....      | 29.67 ozs.      |
| Gold .....        | 1.483 "         |

And a yield per ton of ore of:—

|                                         |          |
|-----------------------------------------|----------|
| Copper (Dry) 3.63% at 11.5 cents.....   | \$8,349  |
| Silver.....2.57 ozs. at 50.82 cents.... | 1,306    |
| Gold.....0.128 " at \$20.00.....        | 2,560    |
| Value per ton of ore.....               | \$12,215 |

### Gold Dredging in British Columbia.\*

In the Cariboo District the only dredge known to have been worked during the past year was a small experimental one operated by Mr. Thos. Drummond. This dredge, of the dipper type, was built in 1899 by the Newall Dredging Co., to test certain leased ground near Quesnel Forks, but for the last couple of years it has lain idle. In the latter part of August Mr. Drummond leased the dredge and

\* Report, Minister of Mines, 1902.



moved it 16 miles down stream, to a point on certain leaseholds which are held by him on the Quesnel river, and which extend for a distance of 10 miles above the mouth of the Beaver. The dredge was at work for about two months, and Mr. Drummond reports that the results obtained were very satisfactory, so far as proving the value of the ground is concerned.

The Cobeldick dredge was working on the Fraser river at Lytton, and, although Lytton is not in the Cariboo District, as this was the only dredge actually found in operation, it may be well to include it here. The Cobeldick Dredge No. 1 Co., with all its belongings, including the dredge itself and five leases of five miles each, was bought out by the Fraser River Gold Dredging Co., Limited, a company formed for that purpose, and chiefly consisting of the same shareholders. The dredge machinery was made in England by Robey & Co., and the scow was made and equipped at Lytton. This dredge is of the chain bucket elevator type, with buckets of  $5\frac{1}{2}$  cubic feet capacity. The ladder was made of wrought iron I beams, but, although very strongly constructed, proved not quite stiff enough. The ladder was set at an angle of about  $20^\circ$ . The chain is made of steel links jointed with steel pins fitted in removable bushings, so that the wear is taken up entirely with these pins and bushings, which are easily, cheaply and quickly replaced, a marked contrast to the bucket elevator in use at Barkerville. The elevator was run at the rate of about 14 buckets to the minute, at which rate it was estimated to be raising about two cubic yards per minute. The dirt elevated in 24 hours was calculated at about 1,800 cubic yards. This dirt was dumped by the elevator on to a revolving iron screen, with  $\frac{3}{8}$  and  $\frac{5}{8}$ -inch round perforations, the tailings passing out over the stern and the screenings dropping through on to gold-saving tables covered with cocoanut matting with expanded metal above. The motive power was a 150 horse-power compound engine, with two locomotive boilers. There is also a separate engine, geared direct to four drums, to handle guy ropes and lift the foot of the ladder. A 12-inch rotary pump supplies the necessary water for washing the gravel. The plant in operation consumed six cords of wood per day, costing \$4 per cord delivered, and employed six men and the dredge-master.

The dredge was found, at the time of the writer's visit, at work on the right bank of the Fraser river, about three-quarters of a mile above Lytton, and was dredging a bar, not on bed-rock, at a depth of from 20 to 35 feet. The dredge was in charge of Mr. F. Graham as superintendent, while Mr. W. N. Turner, an English mechanical engineer, had been sent over as managing director to investigate the working of the plant. Mr. Turner soon became convinced that the lifting of the gravel on board was the lesser difficulty he had to contend with, and that the real trouble was that they were not saving the gold contained in the gravels brought up. To test this he arranged that, at frequent and regular intervals, the dredge should be stopped and the bucket nearest the deck emptied out, and of this dirt a measured boxful was taken as a sample. These "samples" were "assayed" by a Chinaman, on the deck of the dredge, with a rocker—if not a very scientific method of assaying, certainly one of the most accurate known for such material, although the results are necessarily always low, if the work is honestly done. These tests were not completed when the writer visited the dredge, but the following is taken from the report of directors at a meeting held in London on December 30th, 1902, at which Mr. John White, the chairman, said.—

"We have an average of the tests from September 29th to the first week in December. The average comes out at 49.50 grains per cubic yard (a grain of gold is worth about 5 cents). Of course these tests vary very greatly; I find on this sheet that one comes out 21.3, the next 12.63 and another 8.91, but we never had one barren test."

This gives an idea as to the value of the ground being dredged, and there is no reason for thinking that this is an unusually rich bar or portion of the river. Mr. Turner dug a hole in the bar with a dredger and found below nine feet of water that "the first two feet below gave 23.62 grains (of gold) per yard; the next two feet, 10.12 grains; and the next six feet is hardly worth working." As to working costs, the chairman said:—"At present everything over an average of 20 ounces of gold per week is profit."

These values, as given, are in the dirt actually dredged up, but Mr. Turner reported to the writer he was not saving on the tables over 10 per cent. of the gold so dredged up. To again quote from the director's report:—"The gold recovered amounted to £939. We know positively, instead of that representing all the gold we should have recovered, we have 'chucked' 99 per cent. of the gold we had on board overboard."

These statements, both as to the value of the ground and the values recovered, made by a responsible engineer, after careful tests, are remarkable, and indicate the necessity of a thorough investigation of the question of gold-saving, which, when solved, will render the Fraser a very profitable field for gold dredging.

Taking into consideration the foregoing rather remarkable data as to the dredging grounds on the Fraser river, it might be well to draw particular attention to the terms and conditions of British Columbia dredging leases, as compared with those of other Colonies. The average width of the river in the vicinity of these leaseholds is 15 chains. This makes the holding 120 acres per mile of dredging lease, or 600 acres for the usual lease of five miles. Acreage is estimated as in the Australian Colonies, from which comparisons will be drawn. Dredging leases, in common with other classes of alluvial mining, are granted upon payment of a rental based upon the acreage. First, as regards rental and working conditions, those of this Province are much more favorable than in other Colonies where dredging operations are carried on. Compare the following:—

#### BRITISH COLUMBIA (Circular of 28th October 1898.)

Period—20 years, with privilege of renewal at same terms.

Area—Not more than five miles along stream (in the cases under discussion averaging 600 acres).

Rental—\$50 per mile per annum, minimum. (This has never been exceeded on the Fraser or Thompson rivers.)

Working conditions—Development work, \$1,000 per mile per annum. The value of new plant and machinery employed to count as money expended.

The only Colonies whose statutes specifically dealing with this matter are available are New Zealand, New South Wales and Western Australia. The conditions obtaining, with citations of Acts, &c., follow:—

#### NEW ZEALAND (Mining Act, 1898).

Period—Not limited, during continuous compliance with working conditions and payment of rental. After default of payment, which is in advance, for 21 days, distraint and confiscation of plant. (Regulation 83 (2), p. 9).

Area—Not more than one mile along stream, nor total acreage of more than 100 acres. (Sec. 76).

Rental—1st year, 2s. 6d. per acre, say 60 cents.

2nd " 5s. od. " \$1.25

after 7s. 6d. " 1.85

Working conditions—Holder of lease is required to work "continuously, with reasonable diligence and skill," (sec. 85). The Warden may require that each dredging claim shall employ up to seven men for each dredge (sec. 86, sub-sec. 2), but, in lieu of half the number of workmen, capital may be expended instead of such employment,



at the rate or £1,000, say \$5,000, for each man not employed; see sub-section 4, sub-sec. 1 (d), of sec. 85, which provides:—"The holder shall commence and prosecute the construction or acquisition of a dredge for working the claim within such time as the Warden fixes."

NEW SOUTH WALES (Gold and Mineral Dredging Act, 1899).

Area—Maximum of 100 acres. (Sec. 3, sub-sec. 2).

Rental—20s. (\$5) per acre per annum. (Sec. 11, sub-sec. 4 (a)).

Period—Not more than 15 years. (Sec. 3, sub-sec. 4).

Working conditions—Not less than seven men continuously employed on each 100 acres, which number may be increased by the Warden to 10. In lieu of such employment, an expenditure of \$50 say (\$250) for each acre. (Sec. 3, sub-sec. 2).

#### WESTERN AUSTRALIA.

The following summary is taken from the report of the Department of Mines for that Colony for 1899. It may be noted that this Act was framed in order to facilitate the exploitations of some gold deposits found in the salt lakes in the interior of that Colony, where the conditions are much more unfavorable than here, and, accordingly, is not a fair comparison. However, the particulars, so far as obtainable, are given:—

Area—Not to exceed 5,000 acres.

Rent—6d. per acre per annum.

Working conditions—Within one year after granting of lease machinery to the value of £3,000 for every 2,000 acres of leases is to be employed.

This, it will be noticed, seems slightly more favorable than this Province in regard to rental, but the working conditions are very similar. The rental for 600 acres in Western Australia is only \$75 against \$250 here, but the working conditions are an expenditure on machinery alone of \$4,500 within a year, while in British Columbia the working conditions only require a total of \$5,000, including both machinery and labor.

In Queensland and Victoria no difference, so far as can be discovered, is made between dredging and other mining leases. Their rates follow. In both cases continuous working if necessary or immediate forfeiture takes place.

#### QUEENSLAND (Statutes, p. 1868).

Period—21 years, or nearly the same as British Columbia.

Area—Not exceeding 25 acres (British Columbia averaging 600 acres).

Rental—£1 per annum per acre.

#### VICTORIA (Statutes, 1890, p. 2508).

Period—Not exceeding 15 years (British Columbia, 20 years).

Area—Not limited by the Statute.

Rental—5s. (\$1.25) per acre per annum.

To put it shortly, acre for acre, British Columbia is cheaper than any other of the Colonies mentioned. Taking the average mile acreage as 120, it makes the British Columbia rent only  $41\frac{2}{3}$  cents per annum, while the others are:—New Zealand, 1st year, 60 cents; 2nd, \$1.25; after, \$1.85. New South Wales, \$5, or more than ten times British Columbia. Queensland, the same as New South Wales; and Victoria, \$1.25 per acre.

The labor requirements, also, are more onerous than here. New South Wales, as pointed out before, for the same area would require continuous working of 42 men (which might be increased to 60) for each five miles. In New Zealand, vide section 85, sub-section 1 (d), to quote, "the holder shall commence and prosecute the construction or acquisition of a dredge for working the claim within such time as the Warden fixes." By regulation 81, made under the authority of the Act, it is further provided that the Warden may require not more

than seven men to be employed on each of such dredges, making a total of 42 men, the same as New South Wales. Further, the mileage of a British Columbia lease covering five of those of New Zealand, five dredges must in that Colony be immediately constructed within the area of one of British Columbia lease.

#### Compressed Air in the Elevation of Tailings.\*

A good deal of experimental work has been done from time to time on the application of compressed air to the elevation of wet pulp. On account of the flat nature of most of our mill sites, elevation of the pulp has to be provided for, and the various methods in vogue show considerable loss of time in the replacing of wearing parts. During the last two years the writer has carried out a great many experiments with a view of devising an elevator that will give continuous work with a minimum of wear.

The results do not show a high efficiency for the power employed, but the lift is continuous in operation, very cheaply installed, and possesses no wearing parts. The lift was tried working in a bore hole of 8 in. diameter, but in many cases it is more convenient to sink a small well for the purpose. The result to date showed that the most efficiency was obtained when the depth of the well was not less than the height of the lift required. The pressure of air required in pounds per square inch was (approximately) half the number of feet to be lifted. In the majority of cases the lift required varied between 20 ft. and 50 ft., and the air pressure required between 10 lbs. and 25 lbs. per square inch.

In most existing installations the air compressors in use were delivering air to the receivers at about four times that pressure, and when air so compressed was expanded to perform its work at a reduced pressure, it was apparent that the power exerted in originally compressing the air above the working pressure required at the lift was absolutely lost.

Thus, at the Mount Malcolm mines it was found that the lift only gave an efficiency of 35 per cent. of the compressor, under the following conditions:—

|                                               |        |
|-----------------------------------------------|--------|
| Height of lift above surface of well.....     | 52 ft. |
| Depth of well.....                            | 54 ft. |
| Air pressure at receiver per square inch..... | 58 lb. |
| Reduced air pressure at lift.....             | 27 lb. |

The air was conducted from the receiver through a reducing valve to the lift. The rising main was a 4 in. black pipe, and the air inlet through 1 in. pipe. This elevator was capable of lifting 100 tons tailings in 24 hours. The most wear was shown on the top bend, which had a life of about six months; in the rest of the pipe the wear was normal.

In this instance had the air been taken direct from the compressor at the working pressure of 27 lbs., the lift would have shown a much higher efficiency.

It became apparent that to work this system with economy, an independent compressor, designed expressly for giving large quantities of air at low pressure, must be employed. The writer subsequently installed two such—one at the Guests Gold Mine, Mount Morgan, and a similar one at the Lancefield Gold Mine, Laverton. In both cases small compressors were geared on to the line shaft, and they delivered their air, without any receiver, direct to the foot of the lift. Under such conditions the only back pressure on the compressor was the weight of a column of water equal to the submerged part of the lift, and the rising or falling of the level of the surface of the well was a perfect governor to the compressor. Unfortunately, it has been found impracticable up to the present to calculate the efficiency returned by

\* Paper. J. W. Archibald, Transactions, Australasian Institute M.E.



the lift under these conditions, on account of the difficulty in arriving at the actual horse power used by the compressor; but in both cases these lifts are regarded as eminently satisfactory by the managers.

It appeared to the writer that under the last named conditions the efficiency of this lift was much greater than had hitherto been estimated. The following data, however, taken from observations at the Guests Gold Mine do not show a high efficiency. This was probably due to the fact that the compressor was a very crude one, and that being above the capacity required, the back pressure of air may have averaged less than the figures taken. At this mill, of 20 stamps, there is 11.25 cubic feet of pulp, containing 93 lbs. sand, delivered per minute. This was elevated 28 ft., equal to a lift of 21,000 lbs. 1 ft. per minute. Theoretically this would require 11.25 cubic feet of air, at a pressure of one atmosphere (or 22.5 cubic feet atmosphere) delivered to the lift per minute, and this would work out at the equivalent of one horse power. But as the capacity of the lift was considerably greater than was required, the surface of the pulp was generally about 4 ft. below the top of the well, and the lift air gauge showed a pressure of from 9 lbs. to 11 lbs. This lift has a 4 in. column air inlet through 1 in. pipe; depth of well, 28 ft.; height of lift, 27 ft. The compressor took 50 cubic feet of atmosphere per minute, which, at 11 lbs. pressure per square inch, was (approximately) 32 cubic feet, and as that was brought from the air compressor cylinder directly into contact with the cold pulp, there would be a considerable loss due to the lower temperature. This had not been accurately determined, but he estimated it at about 14 per cent. (on the basis of 18 per cent. of one atmosphere), and, making allowance for that, they would have 29.7 cubic feet of air at the temperature of the pulp. Therefore, the volume of compressed air in the rising main would be at 2.64 to 1 of pulp—an average compression of 6 lbs. of air. At 11 lbs. pressure the average load against the compressor piston was 8.914 lbs. per square inch, which would work out in the compressor employed at 2.165 horse-power. This was employed to lift (approximately) 21,000 lbs. 1 ft. per minute, showing an efficiency of only 32 per cent. of the power required for the compressor.

The principal points in favor of this system are:—

1. Cheapness of installation.
2. Absence of wearing parts.
3. Uniform continuity of operation.

The cost of installation involves the sinking of a well or bore hole to the depth required to be lifted, and an ordinary pipe of the size required from the bottom of the well to the delivery point, and an air pipe from the compressor to the bottom of the delivery pipe. When the rising column was of a size proportionate to the volume required to be lifted, there was very little sign of wear on the pipes, except on the top bend, which wore out on top in about six months.

Regarding uniformity of operation, when the installation was once made, there was no chance for anything to go wrong. Pieces of stone, which might be washed into the well through the breaking of screens, were carried up through the pipe without difficulty.

At both the mines mentioned there had been no stoppage during the last nine months from any cause due to the faulty working of the elevator. At the Guests mine the pipe was vertical to the required height, and thence horizontal over a series of vats; but the rising column may also be taken in a sloping direction.

As the efficiency of all compressors decreases in proportion to the pressure required, it is evident that the pneumatic elevators will give greatest efficiency where the lift required is not very high. In cases where the lift required is not excessive, the cheapness of installation, coupled with the unfailing continuity of operation, may be found to be strong recommendations for employing this form of elevator.

## The Refining of Lead Bullion.\*

By F. L. PIDDINGTON.

In presenting this account of the Parkes' process of desilverising and refining lead bullion the writer claims no originality, but hopes that a description of the process as carried out at the works of the Smelting Company of Australia may be of interest to members; it is possible, also, that the subject may borrow some additional interest from recent developments on these fields.

The Parkes' process may be conveniently summarised as follows:—

1. Softening of the base bullion to remove copper, antimony, etc.
2. Removal of precious metals from the softened bullion by means of zinc.
3. Refining the desilverised lead.
4. Liquefaction of gold and silver crusts obtained from operation 2.
5. Retorting the liquated alloy to drive off zinc.
6. Concentrating and refining bullion from 5.

Softening is done in reverberatory furnaces. In large works two furnaces are used—copper, antimony and arsenic being removed in the first and antimony in the second. The size of the furnaces is naturally governed by the quantity to be treated. In these works (refining some 200 tons weekly) a double set of 15-ton furnaces were at work. The sides and ends of these furnaces are protected by a jacket with a 2 in. water space, the jacket extending some 3 in. above the charge level and 6 in. to 9 in. below it. The furnace is built into a wrought iron pan, and if the brickwork is well laid into the pan there need be no fear of lead breaking through below the jacket. The bars of bullion (containing as a rule 2 to 3 per cent. of impurities) are placed in the furnace carefully to avoid injuring the hearth and melted down slowly. The copper dross separates out and floats on top of the charge, which is stirred frequently to expose fresh surfaces. If the furnace is overheated some dross is melted into the lead again and will not separate out until the charge is cooled back. However carefully the work is done some copper remains with the lead and its effects are to be seen in the later stages. The dross is skimmed into a slag pot with a hole bored in it some 4 in. from the bottom; any lead drained from the pot is returned to the charge. The copper dross is either sent back to the blast furnace direct or may be first liquated. By the latter method some 30 per cent. of the lead contents of the dross is recovered in the refinery. Base bullion made at a customs' smelter will often vary greatly in composition and it is, therefore, difficult to give any hard and fast figures as to percentage of metals in the dross. As a rule our dross showed 65 to 70 per cent. lead, copper 2 to 9 per cent. (average 4 per cent.), gold and silver values varying with the grade of the original bullion, though it was difficult to detect any definite relation between bullion and dross. It was, however, noticed that gold and silver values increased with the percentage of copper.

Immediately the copper dross is skimmed off, the heat is raised considerably and very soon a tin (and arsenic, if present) skimming appears. It is quite "dry" and may be removed in an hour or so. It is a very small skimming and the tin not being worth saving, is put with the copper dross.

The temperature is now raised again and antimony soon shows in black boiling oily drops, gathering in time into a sheet covering the surface of the lead. When the skimming is about  $\frac{1}{2}$  in. thick, slaked lime, ashes or fine coal is thrown on and stirred in. The dross soon thickens up and may be skimmed off easily. This operation is repeated

\*Paper read before the Chemical, Metallurgical and Mining Society of South Africa.



until all antimony, is eliminated. Constant stirring of the charge is necessary. The addition of litharge greatly facilitates the removal of antimony, or steam or air may be blown on the surface of the metal to hasten oxidation, though they have anything but a beneficial effect on the furnace lining. From time to time samples of the dross are taken in a small ladle and after setting hard the sample is broken in two. A black vitreous appearance indicates plenty of antimony yet in the charge. Later samples will look less black, until finally a few yellowish streaks are seen, being the first appearance of litharge. When all antimony is out the fracture of a sample should be quite yellow and the grain of the litharge long, a short grain indicating impurities still present, in which case another skimming is necessary. The analysis of a representative sample of antimony dross was as follows:—

|                                |   |       |           |
|--------------------------------|---|-------|-----------|
| PbO                            | = | 78.11 | per cent. |
| Sb <sub>2</sub> O <sub>4</sub> | = | 8.75  | "         |
| As <sub>2</sub> O <sub>3</sub> | = | 2.18  | "         |
| CuO                            | = | 0.36  | "         |
| CaO                            | = | 1.10  | "         |
| Fe <sub>2</sub> O <sub>3</sub> | = | 0.42  | "         |
| Al <sub>2</sub> O <sub>3</sub> | = | 0.87  | "         |
| Insol.                         | = | 4.10  | "         |

Antimony dross is usually kept separate and worked up from time to time, yielding hard antimonial lead, used for type metal, Britannia metal, etc.

**DESILVERISATION.**—The softening being completed the charge is tapped and run to a kettle or pan of cast iron or steel, holding, when conveniently full, some 12 to 13 tons. The lead falling into the kettle forms a considerable amount of dross, which is skimmed off and returned to the softening furnace. By cooling down the charge until it nearly "freezes" an additional copper skimming is obtained, which also returns to the softener. The kettle is now heated up to the melting point of zinc and the zinc charge, determined by the gold and silver contents of the kettle, is added and melted. The charge is stirred, either by hand or steam, for about an hour, after which the kettle is allowed to cool down for some three hours and the first zinc crust taken off. When the charge is skimmed clean a sample of the bullion is taken for assay, and while this is being done the kettle is heated up again for the second zinc charge, which is worked in the same way as the first; sometimes a third addition of zinc is necessary. The resulting crusts are kept separate, the second and third being added to the next charge as "returns" allowing 3 lbs. of zinc in returns as equal to 1 lb. of fresh zinc. An alternative method is to take out gold and silver in separate crusts, in which case the quantity of zinc first added is calculated on the gold contents of the kettle only. The method of working is the same, though subsequent treatment may differ in that the gold crusts are cupelled direct.

As to the quantity of zinc required:—

1. Extracting the gold with as little silver as possible the following figures were obtained:—

|                               |                           | Au.      |
|-------------------------------|---------------------------|----------|
| Total gold in kettle—300 oz.: | 1 lb. zinc takes out..... | 1.30 oz. |
| " " 200 oz.:                  | " ".....                  | 1.00 "   |
| " " 150 oz.:                  | " ".....                  | 0.79 "   |
| " " 100 oz.:                  | " ".....                  | 0.59 "   |
| " " 60 oz.:                   | " ".....                  | 0.45 "   |

2. Silver zincing gave the following general results with 11-ton charges:—

|                             |                           |         |
|-----------------------------|---------------------------|---------|
| Silver in kettle—1,450 oz.: | 1 lb. zinc takes out..... | 5.6 oz. |
| " " 1,200 oz.:              | " ".....                  | 4.1 "   |
| " " 930 oz.:                | " ".....                  | 3.8 "   |
| " " 755 oz.:                | " ".....                  | 3.5 "   |
| " " 616 oz.:                | " ".....                  | 3.4 "   |
| " " 460 oz.:                | " ".....                  | 2.6 "   |

3. Extracting gold and silver together:—

| Total contents of kettle. |       | 1 lb zinc takes out. |      |
|---------------------------|-------|----------------------|------|
| Au.                       | Ag.   | Au.                  | Ag.  |
| oz.                       | oz.   | oz.                  | oz.  |
| 494                       | 3,110 | 0.59                 | 3.60 |
| 443                       | 1,883 | 0.64                 | 2.80 |
| 330                       | 2,417 | 0.45                 | 3.34 |
| 204                       | 1,638 | 0.36                 | 2.86 |
| 143                       | 1,330 | 0.28                 | 2.65 |
| 123                       | 1,320 | 0.23                 | 2.54 |

It will be noticed that in each case the richer the bullion the greater the extractive power of zinc. Experiments made on charges of rich bullion showed that the large amount of zinc called for by the table in use was unnecessary and 250 lbs. was fixed on as the first addition of zinc. On this basis an average of 237 charges gave results as follows:—

| Total contents |       | Zinc used | 1 lb. zinc takes out |      |
|----------------|-------|-----------|----------------------|------|
| Au.            | Ag.   | lbs.      | Au.                  | Ag.  |
| oz.            | oz.   |           | oz.                  | oz.  |
| 520            | 1,186 | 407.5     | 1.27                 | 2.91 |

The zinc used was that necessary to clean the kettle, added as follows:—1st, 250 lbs.; 2nd (average), 127 lbs.; 3rd (average), 57 lbs. In 112 cases no third addition was required. From these figures it appears that in the earlier work the zinc was by no means saturated.

**REFINING THE LEAD.**—Gold and silver being removed, the lead is siphoned off into the refining kettle and the fire made up. In about 4 hours the lead will be red hot, and when hot enough to burn zinc, dry steam, delivered by a  $\frac{3}{4}$  in. pipe reaching nearly to the bottom of the kettle, is turned on. The charge is stirred from time to time, and wood is fed on the top to assist de-zincing and prevent the formation of too much litharge. In 3 to 4 hours the lead will be soft and practically free from zinc. When test strips show the lead to be quite soft and clean the kettle is cooled down and the scum of lead and zinc oxides skimmed off. In an hour or so the lead will be cool enough for moulding; the bar should have a yellow lustre on the face when set; if the lead is too cold it will be white, if too hot a deep blue. The refining kettles are subjected to severe strain during the steaming process and hence their life is uncertain—an average would be about 60 charges—the zinking kettles on the other hand last very much longer. Good steel kettle (if they can be obtained) are preferable to cast iron.

**TREATMENT OF ZINC CRUSTS.**—Having disposed of the lead, let us return now to the zinc crusts. These are first liquated in a small reverberatory furnace, the hearth of which is formed of a cast iron plate (the edges of the long sides being turned up some 4 in) laid on brasque filling with a fall from bridge to flue of  $\frac{3}{4}$  in. per foot and also sloping from sides to centre. The operation is conducted at a low temperature, and the charge is turned over at intervals, the liquated lead running out into a small separately fired kettle. This lead rarely contains more than a few ounces of Ag per ton; it is baled into bars and returned to the zinking kettles or worked up in a separate charge. In 2 to 3 hours the crust is as "dry" as it is advisable to make it, and the liquated alloy is raked out over a slanting perforated plate to break it up and goes to the retort bin.

**RETORTING THE ALLOY.**—This is carried out in Du Faur tilting furnaces—simply a cast-iron box swinging on trunnions and lined with firebrick. Battersea retorts (class 409) holding 560 lbs. each are used—their average life is about 30 charges. The retorts are charged hot, a small shovel of coal being added with the alloy. The condenser is now put in place and luted on; it is made of  $\frac{1}{8}$  in. iron bent to form a cylinder 12 in. in diameter, open at one end; it is lined with a mixture of lime, clay and cement. It has three holes, one on the upper side close to the furnace and through which a rod can be passed into the retort, a vent hole on the upper side away from the furnace, and a tap



hole on the bottom for condensed zinc. In an hour or so the flame from the vent hole should be green, showing that distillation has begun. When condensation ceases (shown by the flame) the condenser is removed and the bullion skimmed and poured into bars for the cupel. The products of retorting are bullion, zinc, zinc powder and dross. Bullion goes to the cupel, zinc is used again in the desilverising kettles, powder is sieved to take out scraps of zinc and returned to the blast furnace, or it may be, and sometimes is, used as a precipitating agent in cyanide work; dross is either sweated down in a cupel with lead or litharge, together with outside material such as zinc gold slimes from cyanide works, jeweller's sweep, mint sweep, &c., or in the softening furnace after the antimony has been taken off. In either case the resulting slag goes back to the blast furnace. The total weight of alloy treated is approximately 7 per cent. of the original base bullion. The zinc recovered is about 60 per cent. of that used in desilverising. The most important source of temporary loss is the retort dross (consisting of lead-zinc-copper alloy with carbon, silica and other impurities), and it is here that the necessity of removing copper in the softening process is seen, since any copper comes out with the zinc crusts and goes on to the retorts, where it enters the dross, carrying gold and silver with it. If much copper is present the dross may contain more gold and silver than the retort bullion itself. In this connection, I remember an occasion on which some retort dross yielded gold and silver to the extent of over 800 and 3,000 ounces per ton respectively.

**CUPELLATION.**—Retort bullion is first concentrated up (together with bullion resulting from dross treatment) to 50-60 per cent. gold and silver in a water jacketed cupel. The side lining is protected by an inch water pipe embedded in the lining at the litharge level or by a water jacket, the inner face of which is of copper; the cupel has also a water jacketed breast so that the front is not cut down. The cupel lining may be composed of limestone, cement, fireclay and magnesite in various proportions, but a simple lining of sand and cement was found quite satisfactory. When the bullion is concentrated up to 50-60 per cent. gold and silver it is baled out and transferred to the finishing cupel where it is run up to about 995 fine; it is then ready either for the melting pot or parting plant. The refining test by the way is not water cooled.

Re-melting is done in 2,000 oz. plumbago crucibles and presents no special features. In the case of doré bullion low in gold, "sprouting" of the silver is guarded against by placing a piece of wood or charcoal on the surface of the metal before pouring, and any slag is kept back. The quantity of slag formed is, of course, very small, so that the bars do not require much cleaning.

The parting plant was not in operation in my time, and I am therefore unable to go into details. The process arranged for was briefly as follows:—Solution of the doré bullion in  $H_2SO_4$ ; crystallisation of silver as monosulphate by dilution and cooling; decomposition of silver sulphate by ferrous sulphate solution giving metallic silver and ferric sulphate, which is reduced to the ferrous salt by contact with scrap iron. The gold and silver are washed thoroughly with hot water and cast into bars.

In conclusion some variations in practice may be noted. The use of two furnaces in the softening process has already been mentioned; by this means the drossing and softening are more perfect and subsequent operations thereby facilitated; further, the furnaces being kept at a more equable temperature are subject to less wear and tear. Zinc crusts are sometimes skimmed direct into an alloy press in which the excess of lead is squeezed out while still molten; liquation is then unnecessary. Refining of the lead may be effected by a simple scorification in a reverberatory, the soft lead being run into a kettle from which it is moulded into market bars.

These and similar points, however, do not fall within the scope of this paper, which is simply an account of some personal experience in a most interesting branch of metallurgy; this, it is to be feared, must be the writer's only apology for introducing a subject somewhat outside the range of "practical politics" as at present defined on the Rand.

### Electrolytic Lead-Refining at Trail, B.C.\*

By ANSON G. BETTS, TRÖY, N.Y.

A solution of lead-fluosilicate, containing an excess of fluosilicic acid, has been found to work very satisfactorily as an electrolyte for refining lead. It conducts the current well, is easily handled and stored, non-volatile and stable under electrolysis, may be made to contain a considerable amount of dissolved lead, and is easily prepared from inexpensive materials. It possesses, however, in common with other lead electrolytes, the defect of yielding a deposit of lead lacking in solidity, which grows in crystalline branches towards the anodes, causing short circuits. But if a reducing-action (practically accomplished by the addition of gelatine or glue) be given to the solution, a perfectly solid and dense deposit is obtained, having very nearly the same structure as electrolytically-deposited copper, and a specific gravity of about 11.36—that of cast-lead.

Lead-fluosilicate may be crystallized in very soluble, brilliant crystals, resembling those of lead-nitrate and containing four molecules of water of crystallization, with the formula  $PbSiF_6 \cdot 4H_2O$ . This salt dissolves at 15° C. in 28 per cent. of its weight of water, making a syrupy solution of 2.38 sp. gr. Heated to 60° C., it melts in its water of crystallization. A neutral solution of lead-fluosilicate is partially decomposed on heating, with the formation of a basic insoluble salt and free fluosilicic acid, which keeps the rest of the salt in solution. This decomposition ends when the solution contains, perhaps, 2 per cent. of free acid; and the solution may then be evaporated without further decomposition. The solutions desired for refining are not liable to this decomposition, since they contain much more than 2 per cent. of free acid. The electrical conductivity depends mainly on the acidity of the solution.

My first experiments were carried out without the addition of gelatine to the fluosilicate solution. The lead-deposit consisted of more or less separate crystals that grew toward the anode, and, finally, caused short-circuits. The cathodes, which were sheet-iron plates, lead-plated and paraffined, had to be removed periodically from the tanks and passed through rolls, to pack down the lead. When gelatine has been added in small quantities, the density of the lead is greater than can be produced by rolling the crystalline deposit, unless great pressure is used.

The Canadian Smelting Works, Trail, British Columbia, have installed a refinery, making use of this process. There are 28 refining-tanks, each 86 in. long, 30 in. wide and 42 in. deep, and each receiving 22 anodes of lead-bullion with an area of 26 by 33 in. exposed to the electrolyte on each side, and 23 cathodes of sheet-lead, about  $\frac{1}{16}$  in. thick, prepared by deposition on lead-plated and paraffined-iron cathodes. The cathodes are suspended from 0.5 by 1 in. copper-bars, resting crosswise on the sides of the tanks. The experiment has been thoroughly tried, of using iron-sheets to receive a deposit thicker than  $\frac{1}{16}$  in.; that is, suitable for direct melting without the necessity of increasing its weight by further deposition as an independent cathode; but the iron-sheets are expensive, and are slowly pitted by the action of the acid-solution; and the lead-deposits thus obtained are much less smooth and pure than those on lead-sheets.

\* Paper read before the American Institute of Mining Engineers.



The smoothness and the purity of the deposited lead are proportional. Most of the impurity seems to be introduced mechanically through the attachment of floating particles of slime to irregularities on the cathodes. The effect of roughness is cumulative; it is often observed that particles of slime attract an undue amount of current, resulting in the lumps seen on the cathodes. Samples taken at the same time showed from 1 to 2.5 oz. silver per ton in rough pieces from the iron cathodes, 0.25 oz. as an average for the lead-sheet cathodes, and only 0.04 oz. in samples selected for their smoothness. The variation in the amount of silver (which is determined frequently) in the samples of refined-lead is attributed not to the greater or less turbidity of the electrolyte at different times, but to the employment of new men in the refinery, who require some experience before they remove cathodes without detaching some slime from the neighboring anodes.

The shape of the electrodes, and the method of handling them to and from the tanks, are shown in Fig. 1.

Each tank is capable of yielding, with a current of 4000 amperes, 750 lbs. of refined-lead per day. The voltage required to pass this current was higher than expected, as explained below; and for this reason, and also because the losses of solution were very heavy until proper apparatus was put in to wash thoroughly the large volume of slime produced (resulting in a weakened electrolyte), the current used has probably averaged about 3000 amperes. The short-circuits were also troublesome, though this difficulty has been greatly reduced by frequent inspection and careful placing of the electrodes. At one time, the solution in use had the following composition in grammes per 100 c.c.: Pb, 6.07; Sb, 0.0192; Fe, 0.2490;  $\text{SiF}_6$ , 6.93, and As, a trace. The current passing was 2800 amperes, with an average of about 0.44 volts per tank, including bus-bars and contacts. It is not known what was the loss of efficiency on that date, due to short-circuits; and it is, therefore, impossible to say what resistance this electrolyte constituted.

Hydrofluoric acid of 35 per cent. used as a starting-material for the preparation of the electrolyte, is run by gravity through a series of tanks for conversion into lead-fluosilicate. In the top tank is a layer of quartz 2 ft. thick, in passing through which the hydrofluoric acid dissolves silica, forming fluosilicic acid. White lead (lead-carbonate) in the required quantity is added in the next tank, where it dissolves readily and completely with effervescence. All sulphuric acid and any hydrofluoric acid that may not have reacted with silica settle out in combination with lead as lead-sulphate and lead-fluoride. Lead-fluosilicate is one of the most soluble of salts; so there is never any danger of its crystallizing out at any degree of concentration possible under this method. The lead-solution is then filtered and run by gravity into the refining-tanks.

The solution originally used at Trail contained about 6 per cent. Pb and 15 per cent.  $\text{SiF}_6$ .

The electrical resistance in the tanks was found to be greater than had been calculated for the same solution, plus an allowance for loss of voltage in the contacts and conductors. This is partly, at least, due to the resistance to free motion of the electrolyte, in the neighborhood of the anode, offered by a layer of slime which may be anything up to  $\frac{1}{2}$  in. thick. During electrolysis, the  $\text{SiF}_6$  ions travel toward the anodes, and there combine with lead. The lead and hydrogen travel in the opposite direction and out of the slime; but there are comparatively few lead ions present, so that the solution in the neighborhood of the anodes must increase in concentration and tend to become neutral. This greater concentration causes an E. M. F. of polarization to act against the E. M. F. of the dynamo. This amounted to about 0.02 v. for each tank. The greater effect comes from the

greater resistance of the neutral solution with which the slime is saturated. There is, consequently, an advantage in working with rather thin anodes, when the bullion is impure enough to leave slime sticking to the plates. A compensating advantage is found in the increased ease of removing the slime with the anodes, and wiping it off the scrap in special tanks, instead of emptying the tanks and cleaning out, as is done in copper-refineries.

It is very necessary to have adequate apparatus for washing solution out of the slime. The filter first used consisted of a supported filtering-cloth with suction underneath. It was very difficult to get this to do satisfactory work by reason of the large amount of fluosilicate to be washed out with only a limited amount of water. At the present time the slime is first stirred up with the ordinary electrolyte several times, and allowed to settle, before starting to wash with water at all. The Trail plant produces daily 8 or 10 cu. ft. of anode residue, of which over 90 per cent. by volume is solution. The evaporation from the total tank-surface of something like 400 sq. ft. is only about 15 cu. ft. daily; so that only a limited amount of wash-water is to be used—namely, enough to replace the evaporated water, plus the volume of the slime taken out.

The tanks are made of 2-in. cedar, bolted together and thoroughly painted with rubber-paint. Any leaks are caught underneath on sloping-boards. Solution is circulated from one tank to another by gravity, and is pumped from the lowest to the highest by means of a wooden pump. The 22 anodes in each tank together weigh about 3 tons, and dissolve in from 8 to 10 days, two sets of cathodes usually being used with each set of anodes. While 300-lb. cathodes can be made, the short-circuiting gets so troublesome with the spacing used that the loss of capacity is more disadvantageous than the extra work of putting in and taking out more plates. The lead-sheets used for cathodes are made by depositing about  $\frac{1}{16}$  in. metal on paraffined steel-sheets in 4 of the tanks, which are different from the others only in being a little deeper.

The anodes may contain any or all of the elements, gold, silver, copper, tin, antimony, arsenic, bismuth, cadmium, zinc, iron, nickel, cobalt and sulphur. It would be expected that gold, silver, copper, antimony, arsenic and bismuth, being more electronegative than lead, would remain in the slime in the metallic state, with, perhaps, tin, while iron, zinc, nickel and cobalt would dissolve. It appears that tin stands in the same relation to lead that nickel does to iron, that is, they have about the same electromotive forces of solution, with the consequence that they can behave as one metal and dissolve and deposit together. Iron, contrary to expectation, dissolves only slightly, while the slime will carry about 1 per cent. of it. It appears from this that the iron exists in the lead in the form of matte. Arsenic, antimony, bismuth, and copper have electromotive forces of solution more than 0.3 volt below that of lead. As there is no chance that any particle of one of these impurities will have an electric potential of 0.3 volt above that of the lead with which it is in metallic contact, there is no chance that they will be dissolved by the action of the current. The same is even more certainly true of silver and gold. The behavior of bismuth is interesting and satisfactory. It is as completely removed by this process of refining as antimony is. No other process of refining lead will remove this objectionable impurity so completely. Tin has been found in the refined-lead to the extent of 0.02 to 0.03 per cent. This we had no difficulty in removing from the lead by poling before casting. There is always a certain amount of dross formed in melting down the cathodes; and the lead-oxide of this reacts with the tin in the lead at a comparatively low temperature.

The extra amount of dross formed in poling is small, and amounts



to less than 1 per cent. of the lead. The dross carries more antimony and arsenic than the lead, as well as all the tin. The total amount of dross formed is about 4 per cent. Table I shows its composition.

TABLE I.—*Analyses of Dross.*

Analyses of the lead from which this dross was taken, see Table II.

| No. | No. in Table II. | Cu. per cent. | As. per cent. | Sb. per cent. | Fe. per cent. | Zn.  |
|-----|------------------|---------------|---------------|---------------|---------------|------|
| 1   | 2                | 0.0005        | 0.0003        | 0.0016        | 0.0016        | None |
| 2   | 3                | 0.0010        | 0.0008        | 0.0107        | 0.0011        | "    |

The electrolyte takes up no impurities, except possibly, a small part of the iron and zinc. Estimating, that the anodes contain 0.01 per cent. of zinc and soluble iron, and that there are 150 cu. ft. of the solution in the refinery for every ton of lead turned out daily, in one year the 150 cu. ft. will have taken up 93 lbs. of iron and zinc, or about one per cent. These impurities can accumulate to a much greater extent than this before their presence will become objectionable. It is possible to purify the electrolyte in several ways. For example, the lead can be removed by precipitation with sulphuric acid, and the fluosilicic acid precipitated with salt as sodium-fluosilicate. By distillation with sulphuric acid the fluosilicic acid could be recovered, this process, theoretically, requiring but one-third as much sulphuric acid as the decomposition of fluorspar, in which the fluorine was originally contained.

The only danger of lead-poisoning to which the workmen are exposed occurs in melting the lead and casting it. In this respect the electrolyte process presents a distinct sanitary advance.

A plant for the operation of this process will consist of a power-plant, furnishing an electrolyzing-current of several thousand amperes, with a voltage depending on the number of tanks; a tank-house, with electric-cranes for handling a tank-load of anodes or cathodes at once; apparatus for making "starting"-cathodes of sheet lead; preferably of lead cut from sheets rolled at the refinery; pumps and storage-tanks for handling the electrolyte; and a cellar beneath the tanks for the passage of tank-cars removing that part of anode-slimes which falls from the plates. The finished cathodes, after rinsing, would be carried off to the lead-casting kettle. The casting-room would contain either a rotating- or belt-conveyor, for passing the open anode-molds beneath the end of the siphon through which lead is flowing from the bullion-kettle. The bars of lead would be molded, as is usually done in refining works, by siphoning into a semi-circular row of molds. There would be either a washing-, drying- and sampling-plant for the slime, in case it is sold, or a reduction-mill, if it is worked into bullion. The latter is much the best, if the location of the plant is not so remote that the express charges on the bullion will balance the saving.

For the treatment of slime, the only method in general use consists in suspending the slime in a solution capable of dissolving the impurities and supplying, by a jet of steam and air forced into the solution, the air necessary for its reaction with, and solution of, such an inactive metal as copper. After the impurities have been mostly dissolved, the slime is filtered off, dried and melted, under such fluxes as soda, to a doré bullion.

The amount of power required is calculated thus: Five amperes in 24 hours make 1 lb. of lead per tank. One ton of lead equals 10,000 ampere days, and at 0.35 volts per tank, 3500 watt-days, or 4.7 E.H.P. days. Allowing 10 per cent. loss of efficiency in the tanks (we always get less lead than the current which is passing would indicate), and of 8 per cent. loss in the generator increases this to about 5.6 H.P. days, and a further allowance for the electric lights and other applications gives from 7 to 8 H.P. days as about the amount per ton of lead. At \$30 per year, this item of cost is something like 65 cents

per ton of lead. So this is an electro-chemical process not especially favored by water-power.

The cost of labor is not greater than in the zinc desilverization process. A comparison between this process and the Parkes process, on the assumption that the costs for labor, interest and general expenses are about equal, shows that about \$1 worth of zinc and a considerable amount of coal and coke have been done away with, at the expense of power, equal to about 175 H.P. hrs., of the average value of perhaps 65 cents, and a small amount of coal for melting the lead in the electrolytic method.

More important, however, is the greater saving of the metal-values by reason of increased yields of gold, silver, lead, antimony and bismuth, and the freedom of the refined lead from bismuth.

Tables II., III. and IV. show the composition of bullion, slimes and refined lead.

Tables V., VI., VII. and VIII. give the results obtained experimentally in the laboratory on lots of a few pounds up to a few hundred pounds. The results in Tables VI. and VII. were given me by the companies for which the experiments were made.

TABLE II.—*Analyses of Bullion.*

| No. | Fe. per cent. | Cu. per cent. | Sb. per cent. | Sn. per cent. | As. per cent. | Ag. per cent. | Au. per cent. | Pb. per cent. | Ag. P. T. Oz. p. T. | Au. p. T. Oz. p. T. |
|-----|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|
| 1   | 0.0075        | 0.1700        | 0.5400        | 0.0118        | 0.1460        | 1.0962        | 0.0085        | 98.0200       | 319.7               | 2.49                |
| 2   | 0.0115        | 0.1500        | 0.6100        | 0.0158        | 0.0960        | 1.2014        | 0.0086        | 97.9068       | 350.4               | 2.52                |
| 3   | 0.0070        | 0.1600        | 0.4000        | 0.0474        | 0.1330        | 1.0738        | 0.0123        | 98.1665       | 313.2               | 3.60                |
| 4   | 0.0165        | 0.1400        | 0.7000        | 0.0236        | 0.3120        | 0.8914        | 0.0151        | 97.9014       | 260.0               | 4.42                |
| 5   | 0.0120        | 0.1400        | 0.8700        | 0.0432        | 0.2260        | 0.6082        | 0.0124        | 98.0882       | 177.4               | 3.63                |
| 6   | 0.0055        | 0.1300        | 0.7300        | 0.0316        | 0.1030        | 0.6600        | 0.0106        | 98.2693       | 192.5               | 3.10                |
| 7   | 0.0380        | 0.3600        | 0.4030        | .....         | tr.           | 0.7230        | 0.0180        | 98.4580       | 210.9               | 5.25                |

TABLE III.—*Analyses of Slimes.*

| Fe. per cent. | Cu. per cent. | Sb. per cent. | Sn. per cent. | As. per cent. | Pb.   | Zn.  | Bi.  |
|---------------|---------------|---------------|---------------|---------------|-------|------|------|
| 1.27          | 8.83          | 27.10         | 12.42         | 28.15         | 17.05 | None | None |
| 1.12          | 22.36         | 21.16         | 5.40          | 23.05         | 10.62 | "    | "    |

TABLE IV.—*Analyses of Refined Lead.*

| No. | Cu. per cent. | As. per cent. | Sb. per cent. | Fe. per cent. | Zn. per cent. | Sn. per cent. | Ag. Oz. p. T. | Ni, Co, Cd. per cent. | Bi. per cent. |
|-----|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------------------|---------------|
| 1   | 0.0006        | 0.0008        | 0.0005        | .....         | None          | .....         | .....         | .....                 | .....         |
| 2   | 0.0003        | 0.0002        | 0.0010        | 0.0010        | "             | .....         | .....         | .....                 | .....         |
| 3   | 0.0009        | 0.0001        | 0.0009        | 0.0008        | "             | .....         | 0.24          | .....                 | .....         |
| 4   | 0.0016        | .....         | 0.0017        | 0.0014        | .....         | .....         | 0.47          | None                  | .....         |
| 5   | 0.0003        | .....         | 0.0060        | 0.0003        | .....         | .....         | 0.22          | .....                 | .....         |
| 6   | 0.0020        | .....         | 0.0010        | 0.0046        | .....         | .....         | 0.22          | None                  | .....         |
| 7   | 0.0004        | None          | 0.0066        | 0.0013        | None          | 0.0035        | 0.14          | .....                 | .....         |
| 8   | 0.0004        | .....         | 0.0038        | 0.0004        | "             | 0.0035        | 0.25          | .....                 | .....         |
| 9   | 0.0005        | .....         | 0.0052        | 0.0004        | "             | 0.0039        | 0.28          | .....                 | .....         |
| 10  | 0.0003        | None          | 0.0060        | 0.0003        | "             | 0.0049        | 0.43          | .....                 | .....         |
| 11  | 0.0003        | "             | 0.0042        | 0.0013        | "             | 0.0059        | 0.32          | .....                 | .....         |
| 12  | 0.0005        | "             | 0.0055        | 0.0009        | "             | 0.0049        | 0.22          | .....                 | .....         |
| 13  | 0.0005        | "             | 0.0055        | 0.0007        | "             | 0.0091        | 0.11          | .....                 | .....         |
| 14  | 0.0004        | "             | 0.0063        | 0.0005        | "             | 0.0012        | 0.14          | .....                 | .....         |
| 15  | 0.0003        | "             | 0.0072        | 0.0003        | "             | 0.0024        | 0.24          | .....                 | .....         |
| 16  | 0.0006        | "             | 0.0062        | 0.0012        | "             | 0.0083        | 0.22          | .....                 | .....         |
| 17  | 0.0006        | "             | 0.0072        | 0.0011        | .....         | 0.0080        | 0.23          | .....                 | .....         |
| 18  | 0.0006        | "             | 0.0057        | 0.0010        | .....         | 0.0053        | 0.34          | .....                 | .....         |
| 19  | 0.0005        | "             | 0.0066        | 0.0016        | .....         | 0.0140        | 0.38          | .....                 | .....         |
| "   | 0.0005        | "             | 0.0044        | 0.0011        | .....         | 0.0108        | 0.35          | .....                 | .....         |
| 20  | 0.0004        | "             | 0.0047        | 0.0015        | .....         | 0.0072        | 0.22          | .....                 | .....         |
| "   | 0.0004        | "             | 0.0034        | 0.0016        | .....         | Trace         | 0.23          | .....                 | .....         |
| 21  | 0.0022        | "             | 0.0010        | 0.0046        | None          | 0.0081        | 0.38          | None                  | None          |

TABLE V.—*Analyses of Bullion and Refined Lead.*

|                   | Ag. per cent. | Cu. per cent. | Sb. per cent. | Pb. per cent. |
|-------------------|---------------|---------------|---------------|---------------|
| Bullion.....      | 0.50          | 0.31          | 0.43          | 98.76         |
| Refined Lead..... | 0.0003        | 0.0007        | 0.0019        | 99.9971       |



TABLE VI.—*Analyses of Bullion and Refined Lead.*

|               | Cu.<br>per cent. | Bi.<br>per cent. | As.<br>per cent. | Sb.<br>per cent. | Ag.<br>p. t.<br>Oz. | Ag.<br>per cent. | Au.<br>p. t.<br>Oz. | Fe.<br>per cent. | Zn.<br>per cent. |
|---------------|------------------|------------------|------------------|------------------|---------------------|------------------|---------------------|------------------|------------------|
| Bullion ..... | 0.75             | 1.22             | 0.936            | 0.6832           | 358.89              | .....            | 1.71                | .....            | .....            |
| Refined lead. | 0.0027           | .0037            | 0.0025           | 0.0000           | .....               | 0.0010           | None                | 0.0022           | 0.0018           |

TABLE VII.—*Analyses of Bullion, Refined Lead and Slimes.*

|                           | Pb.<br>per cent. | Cu.<br>per cent. | As.<br>per cent. | Sb.<br>per cent. | Ag.<br>p. t.<br>Oz. | Ag.<br>per cent. | Fe, Zn,<br>Ni, Co.<br>per cent. | Bi.   |
|---------------------------|------------------|------------------|------------------|------------------|---------------------|------------------|---------------------------------|-------|
| Bullion .....             | 96.73            | 0.096            | 0.85             | 1.42             | About<br>275*       | .....            | .....                           | ..... |
| Refined lead .....        | .....            | 0.0013           | 0.00506          | 0.0028           | .....               | 0.00068          | 0.0027                          | Trace |
| Slimes (dry sample) ..... | 9.05             | 1.9              | 9.14             | 29.51            | 9366.9              | .....            | 0.49                            | Trace |

TABLE VIII.—*Analyses of Bullion, Refined Lead and Slimes.*

|               | Pb.<br>per cent. | Cu.<br>per cent. | Bi.<br>per cent. | Ag.<br>per cent. | Sb.<br>per cent. | As.<br>per cent. |
|---------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Bullion ..... | 87.14            | 1.40             | 0.14             | 0.64             | 4.0              | 7.4              |
| Lead .....    | .....            | 0.0010           | 0.0022           | .....            | 0.0017           | Trace            |
| Slimes .....  | 10.3             | 9.3              | 0.52             | 4.7              | 25.32            | 44.58            |

The process here described has been patented in the United States, Canada, Mexico, Belgium, France, Great Britain, Germany, Italy, Spain, New South Wales, Victoria and South Australia.

The success thus attained in the electrolysis of lead, generally accepted hitherto as impracticable, may give some encouragement to the employment of similar methods in the treatment of some of the other metals, especially as it is shown to be possible to apply simple means to obviate the chief trouble, spongy deposits.

I wish to express my thanks to Mr. W. H. Aldridge, Dr. Edward F. Kern, and Dr. William Valentine, of the Canadian Smelting Works, for their kindness in giving information and analyses.

\* Silver not given. This was the case, also, with the gold in the bullion. The slimes contained 0.131 per cent. of gold, or 39.1 oz. per ton.

## GEOLOGICAL SURVEY.

**Minister of the Interior will reorganize it on economic lines recommended by the Canadian Mining Institute. More attention to be given to Mining.**

Discussing the annual grant to the Geological Survey in the House of Commons:—

The MINISTER OF THE INTERIOR (Hon. Clifford Sifton). This vote has been decreased by \$10,000 in pursuance of an arrangement that I will explain later on for the purpose of doing the work more especially connected with mining. I intend to introduce a resolution on the subject.

Mr. MONK.—It would be interesting to know what plan of survey and exploration is being pursued. In what direction are the officers going to operate this year?

The MINISTER OF THE INTERIOR.—There are fifteen exploring parties now in the field; one in the Yukon, one in the Peace River district, one connected with the boundary survey north of the forty-ninth parallel in British Columbia, one in the anthracite region of the Rocky Mountains, one in the Keewatin district, three in Northern Ontario, one in the Bay of Quinte district, one in the Lake St. John district, two in New Brunswick, two in Nova Scotia, and two whose locations are not yet definitely decided.

Mr. MONK.—Could the hon. minister tell us who is going in the party to the Lake St. John district, and can he give us a little more precise information as to the direction that the exploration is going to take? Is it to be due north of Lake St. John or to the east or to the west?

The MINISTER OF THE INTERIOR.—I could not say. If my hon. friend (Mr. Monk) has any suggestion to make in connection with it I would be glad to consider it. The work has not progressed very far in so far as this season is concerned. The information comes from the director of the survey, and I am not quite familiar with the exact location or nature of the work they are doing.

Mr. MONK.—Who is going to be in charge of the party?

The MINISTER OF THE INTERIOR.—One of the technical officers. I cannot say which one.

Mr. MONK.—Who is now at the head of the Geological Survey?

The MINISTER OF THE INTERIOR.—Dr. Bell.

Mr. MONK.—Does he hold a permanent appointment?

The MINISTER OF THE INTERIOR.—No.

Mr. MONK.—How long has he held a temporary appointment?

The MINISTER OF THE INTERIOR.—Ever since the death of Dr. Dawson.

Mr. MONK.—Is there any reason why he should not be confirmed in his appointment? I ask that because I know of him. I know that he has been a very long time employed by the department, and I believe has given great satisfaction. Is there any reason why the appointment should be only of a temporary character?

The MINISTER OF THE INTERIOR.—The question which my hon. friend has asked is a somewhat delicate one. Dr. Bell has been in the service of the Geological Survey for some fourteen years. He was at once appointed to take charge of the work when Dr. Dawson died. All I care to say at this moment is that I have not felt like recommending his permanent appointment up to the present time. I anticipate being able to make some changes which I have had in mind for the last two or three years in connection with the survey and possibly the permanent appointment of Dr. Bell, might be facilitated by these changes. What I propose to suggest is that that which may more properly be called economic work, or work directly connected with mining, shall be separate from the other work and that change I propose to carry out by means of legislation this session, and I was proposing an appropriation for that purpose which will account for the difference in the appropriation which is before us at the present time. I think the question of Dr. Bell's appointment can be settled if the plan is carried out, but I am not prepared to say any more at the present time. The discussion of the scientific qualifications of scientific men is rather a delicate subject and I hesitate to say any more about it.

Mr. MONK.—I mentioned the matter because I have known Dr. Bell for a great many years and although not in a position to judge of his qualifications he appears to have the reputation of having fulfilled his duties properly.

The MINISTER OF THE INTERIOR.—I would not like to be understood as even remotely suggesting that Dr. Bell's qualifications, as far as scientific knowledge is concerned, are not sufficient, but in addition to scientific knowledge the management of the survey and the executive work connected with it have to be considered and the various qualifications that are necessary to carry it out successfully have to be taken into account. I will be responsible for the appointment when it is made, and I shall try to feel that I have discharged that responsibility properly when I do make it. But in the meantime I do not care to say any more about it.

Mr. KAULBACH.—In what part of Nova Scotia is the geological party operating this season?

The MINISTER OF THE INTERIOR.—I have not the exact location. The work of the parties is under the direction of Dr. Fletcher and they are now, I think, in the coal district.

Hon. Mr. ROSS (Victoria).—They are in the County of Cumberland.

Mr. KAULBACH.—They have been in the eastern part of the province for several years. I would like to have them visit the county I have the honour to represent as it is supposed that there are in that county coal deposits of a very valuable character. We would like to ascertain positively whether such is the case or not; and if so we would like these deposits of coal developed?

The MINISTER OF THE INTERIOR.—I did not hear my hon. friend (Mr. Kaulbach) very well, but I understand him to suggest that it is desirable that some work should be done in the county of Lunenburg. I will be happy to note that and discuss it with my hon. friend.

Mr. KAULBACH.—My reason for making that request is in consequence of its being supposed there are deposits of coal in the county of Lunenburg and we are desirous of ascertaining whether there are or not, and if so, we would like to have that article developed.



The MINISTER OF THE INTERIOR.—I have at various times discussed the work of the survey in Nova Scotia with members in the House from Nova Scotia and have received suggestions from them, and to the best of my ability I have endeavoured to carry them out. I am not familiar enough with the particular localities to be able to speak of them by name from recollection, but as far as possible I will endeavour to carry out the work that can be done. I will be very happy to consider my hon. friend's suggestion.

Mr. BELL.—In reference to the Geological Survey I understand that the hon. minister anticipates at an early day dividing the work of the department so as to constitute one section that will be more particularly devoted to work from an economic point of view and another which will be more purely scientific.

The MINISTER OF THE INTERIOR.—Yes, more purely scientific and largely topographical.

Mr. BELL.—I would be very glad to contribute in any way towards the appointment of Dr. Bell on a permanent basis. I have had a good deal of interest always in watching the work of the Geological Survey and in reading the annual reports, and it seems to me that the work has been carried on very efficiently in that department since Dr. Bell has taken charge. I would be only too happy to learn that the changes contemplated by the minister will enable him to make a permanent appointment in that case.

The MINISTER OF THE INTERIOR.—I may say to the committee something that I will say at greater length, when I make the definite proposition I intend to make, that while I have no doubt of the great value of the work that has been done by the Geological Survey, the result of my observation and supervision of the work during the last seven years has led me to the conclusion that sufficient attention has not been given to making the results of the work of practical value and easily available to the public. The difficulty is that information which has been collected at such a vast amount of expense to the country is not in a position to be availed of by the ordinary commercial man or the ordinary prospector. If, for instance, I were asked to furnish a person coming from a foreign country who desired to invest in Canada with the information available on the subject of iron in Canada, I would be utterly at a loss. All I would be able to do would be to refer him to the library of the Geological Survey. There is no place now in which such information is collected. My purpose in organizing a mining branch is primarily to bring about the result that we will have in succinct and in somewhat popular form, all the information of a practical and economical character made readily available, and the duty of the branch would be to put that in shape. During last year I gave some instructions that have been carried out pretty fully in respect to one particular subject, for instance, the subject of nickel. Dr. Barlow, a very capable officer, has been devoting himself last year to preparing a report on nickel. When that report is out I think we will have all the information required with regard to nickel in Canada, so that anyone who reads that book and understands it will know everything that is to be known about our nickel deposits. If anyone asks for information with regard to the economic value of metals we ought to be able to give him that information in the best possible form. That is the principal fault I find with the survey as it is organized at the present time. Of course it is very difficult to make changes; everybody who is connected with an institution is inclined to think that that institution is managed on just about the proper line, but after six or seven years experience I am clear in my opinion that a change is not only desirable but necessary if the country is to get value for the work it is doing.

Mr. BELL.—It seems to me that a very great deal of valuable work might be done at once by simply compiling the material at hand. As it is now, one has to read through a lengthy history and here and there he might find a casual reference to this or that mineral, and in that shape the information is not available for practical men. I am pleased to learn that the minister contemplates so arranging things that he will be able to place in the hands of those interested, information as to the different minerals to be found in our country. It might be well that a special search should be made with a view of discovering certain minerals; for instance, a thorough exploration of the iron areas of our province. If a geological officer is merely sent to a certain district to examine it in a general way it cannot be expected he will achieve such valuable results as would be obtained if a trained officer were sent there with the special object of devoting his whole time to one particular subject. That would be of the highest importance in Nova Scotia with reference to its iron and coal deposits.

The MINISTER OF THE INTERIOR.—That is quite in line with my own observation as the result of the work of the survey, and some of the best officers in the survey have practically said to me that while the general work of the survey should go on, yet at this present stage of development one of the most necessary things is to do that special work to which the hon. gentleman (Mr. Bell) refers. Dr. Barlow has been doing that in the case of nickel, and I think we should detail a competent officer to take up a certain mining field and to examine it thoroughly in its economic features and make a complete and full report about it, so that any person desiring to operate in that field would be in possession of all the information available. Such examination would be more detailed and complete than under a general survey. The coal fields of Nova Scotia are an illustration of the benefit of that kind of work. We have had Mr. Fletcher who is well known to hon. gentleman opposite, I suppose, and who has devoted practically his life to the study of coal in Nova Scotia. He would at once be detailed, with competent assistants, because he could not do all the work himself, to write a monograph on the subject of coal in Nova Scotia, and give us all the information he could get.

Mr. MONK.—Who is in charge of the international boundary survey?

The MINISTER OF THE INTERIOR.—Dr. Daly. He is a Canadian by birth originally educated in Canada and afterwards became a professor of Harvard University. He is a very capable man indeed.

Mr. MONK.—I find in the Auditor General's Report that \$1,065 was paid to D. R. Fletcher of Vermont for granite monuments to mark the boundary line.

The MINISTER OF THE INTERIOR.—We mark the boundary line with iron posts on granite foundations.

Mr. MONK.—Perhaps it is that these were purchased by the United States authorities and that we are bound to share the cost, but if they were purchased by ourselves there is very good granite near where those posts were erected, and we might have got it in our own country.

The MINISTER OF THE INTERIOR.—The cost was divided, but I do not know exactly how.

Mr. MONK.—Who is the officer specially charged with the purchase of instruments?

The MINISTER OF THE INTERIOR.—The officer in charge of any instruments purchased in connection with the land survey, which has to do with the work of marking the boundaries, is not the same as the officer in charge of the purchase of instruments in connection with the Geological Survey. W. F. King, chief astronomer, has charge of all the boundary surveys, and any instruments required for that work would be purchased by him or on his recommendation. For the Geological Survey the acting director makes the purchases.

Mr. MONK.—Then there are two separate officers to attend to the purchase of instruments. Is there any outside purchasing agent employed by the department?

The MINISTER OF THE INTERIOR.—No, no such thing.

Mr. MONK.—I mention the matter to the minister, because at the time the firm of Hearn & Harrison existed in Montreal, which has since gone into liquidation, I heard something of a purchasing agent who resided in Montreal, and through whom all these instruments were alleged to be purchased, though he had no special knowledge of the subject.

The MINISTER OF THE INTERIOR.—I am glad my hon. friend has brought that matter to my attention, because there is absolutely nothing in the suggestion. There is nothing purchased for the Department of the Interior except on the requisition of the deputy minister, and his recommendation is made out by himself upon the recommendation of the officer in charge of the survey. As to recognizing anybody outside the department as purchasing agent, or go-between, or anything of that kind, there is absolutely nothing of the kind, in any shape, form, or manner, and the same thing is true of the Geological Survey, where all the instruments are purchased on the recommendation of the acting director.

Mr. MONK.—I am very glad to hear the hon. minister give us that assurance. What are the principal firms in Canada with which the department deals for the purchase of these instruments?

The MINISTER OF THE INTERIOR.—My deputy tells me that he thinks, speaking from recollection, that as a rule they have to be purchased in the United States. That is entirely so in regard to astronomical instruments.

Mr. MONK.—Most of the purchases seem to be made in the United States, and I realize that for many instruments that may be necessary. But



still I think that before dealing with American firms, it would be advisable to see if those who deal in similar instruments in Canada might not be able to furnish what the department required

The MINISTER OF THE INTERIOR.—My hon. friend may rely on this, that we do not buy anything outside of Canada that we can get in Canada of equal quality, unless by oversight. Even in cases where the prices are a little higher in Canada, we still patronize Canadian dealers. Speaking from my own knowledge, I do not think there are any manufacturers of scientific instruments of the quality and class referred to in Canada with whom we could deal. Any dealers in Canada would be simply small dealers, with only a few instruments on hand. Of manufacturers I am satisfied there are none.

Mr. SPROULE.—The minister touched on a subject which I intended to make a little inquiry about. It is as to where one can get most readily information in regard to any particular mineral. The reason I ask the question is this. A gentleman came here with the view of finding where our iron deposits were and the nature of those deposits. I endeavoured to get the information for him, but found it almost impossible to get any. Is there any way in which that information could be got without much trouble?

The MINISTER OF THE INTERIOR.—That is a matter which has been brought to my attention constantly for some years past. Our information, while in some respects very full, is in such a condition that it cannot be got at. In that respect my hon. friend is as well off as I am. If a gentleman came to my department and asked for information about iron, all I could do would be to call an officer to take him to the Geological Survey and show him to the library, and show him the books in which he could search; and the probability is that he would not know much more after he got through than he did before. To remedy that defect would take some time; but I am going to suggest a change with that object in view.

Mr. SPROULE.—I sent this gentleman to the library; but after searching through it, he said that life was too short to try to get the information from such an imperfect source, and he was afraid it was of little value to him. I thought there would be a complete list of the geological reports in the library, and some index kept up-to-date, so that one could ascertain at once where any of these minerals could be found, and in what volume they could be found. He said further, that even though he could get the information in these geological reports, it was very meagre. It might say whether the ore was magnetic iron or bog iron or sulphurous iron; but it gave very little information beyond that as to the relative quantities of each, as to whether the deposits were large or small or as to the state of development. In all these respects this gentleman, who was from Pittsburg, said the Geological Survey was very imperfect; it was almost impossible to get any intelligent idea of it without a great deal of work. It seems to me that that could be remedied without very much trouble or expense, and I would suggest that the minister devise some way to overcome it, because it is a matter of importance, especially in view of the fact that our mineral deposits are attracting so much attention abroad, and that they are a valuable source of revenue to the country.

Mr. MONK.—I would like to make a suggestion to my hon. friend with reference to this item. I have received letters from different parts of the Province of Quebec, requesting me to go to the Geological Department and try to obtain specimens of mineral, vegetable and animal life; and I must say that in that department every effort is made to give us satisfaction. I think it would be of great use in the education of our people, if the minister could see his way clear to giving instructions to the exploring parties going out each year to secure as many specimens as possible, in order that there should be some for free distribution. In the Province of Quebec we have ten or fifteen colleges maintaining natural history museums. It would be very easy, in most cases, for the officers, when proceeding with their explorations, to secure these specimens and reserve a certain quantity for the educational establishments who would make a demand for them. If that could be done without too much difficulty, the Government could in that way enrich most of those educational establishments and diffuse knowledge throughout the country of its resources.

The MINISTER OF THE INTERIOR.—I do not see any serious difficulty in carrying out the suggestion of my hon. friend. To some extent it has already been done, but perhaps not as systematically as it might have been. I shall endeavour to carry out the suggestion.

Mr. SPROULE.—From time to time we have had discussions regarding the propriety of building another museum, but have not heard much about

it lately. Has anything been done lately in that connection? The museum building we have is quite inadequate.

Mr. LOGAN.—I intend bringing this matter up when we are on the Public Works estimates, but in the meantime, as my hon. friend from Grey has introduced it, I should like to emphasize what he has said regarding the inadequacy of the present building. If hon. members would only visit the Geological Survey on Sussex Street, they would be convinced that the building is a national disgrace while at the same time they would be proud of the collections within its walls. Unfortunately, we cannot do justice to the many valuable specimens collected. Some most valuable Canadian mineral exhibits are stored away in boxes or in high shelves, obscured from sight, instead of being exposed to view. This state of affairs should not be allowed to continue. I would urge every member of Parliament, who has not visited the Geological Survey, to do so, so that when we come to discuss the Public Works estimates, they will be able to give their views on this matter.

The MINISTER OF THE INTERIOR.—I have no dissent to offer to what my hon. friend has said. No one can doubt that we require a suitable building within the least possible delay. We intended proceeding last year, but there were differences of opinion regarding the site, and as this building will be a national museum, the question of site is an important one. The subject has been lately discussed by my colleagues, and I have no doubt that my hon. colleague, the Minister of Public Works, when his estimates are down, will make a full statement.

Mr. INGRAM.—The hon. gentleman from Cumberland (Mr. Logan) has referred to a very important subject. There are some valuable collections in this country, and I think perhaps the Department of the Interior have been approached on the subject of purchasing them. It would be well for the department to secure these valuable collections, which are to be found throughout the country, and I trust the hon. gentleman will lose no time in doing so.

Mr. SPROULE.—Has the Government yet decided on the site?

The MINISTER OF THE INTERIOR.—It has been definitely decided to construct the building and the delay has been due to the difficulty of deciding about the site. It has been suggested that the building should be erected in the park, and then other sites have been suggested. I am not in a position to make any statement, but no doubt the Minister of Public Works will do so. We hope to commence this year and will push the work forward with all rapidity.

Mr. LEFURGEY.—I understand that some surveys were made with regard to locating coal in Prince Edward Island last year. Have the reports been furnished?

The MINISTER OF THE INTERIOR.—Yes, I will bring down the report.

Mr. SPROULE.—I notice that there was a geologist sent down to the Sudbury district, where it is said there is coal. Has the Government any definite information regarding that?

The MINISTER OF THE INTERIOR.—The work of the geologists sent out to the neighbourhood of Sudbury had reference only to deposits of nickel. His report will be available shortly and will be printed separately. I do not remember any report about coal in Sudbury.

Mr. SPROULE.—I saw an item in the paper to the effect that the Government had detailed a special officer to look into that question.

The MINISTER OF THE INTERIOR.—In the Sudbury district?

Mr. SPROULE.—Somewhere near Sudbury—in the nickel region.

The MINISTER OF THE INTERIOR.—I think the report is incorrect. There is no work of that kind done near Sudbury.

Mr. LEFURGEY.—May I ask who it was who recommended the work of surveying for coal in Prince Edward Island?

The MINISTER OF THE INTERIOR.—This was done on the recommendation first of the hon. member for East Queen's (Mr. MacKinnon).

Mr. LEFURGEY.—A large expenditure was made by the local Government a year or two ago just about the time of the elections there by this same gentleman. A large hole was bored, but without any result except that, possibly, the hon. gentleman gained some few votes by the distribution of the money. I cannot understand why, after a failure of this kind such a short time ago, the hon. Minister of the Interior (Hon. Mr. Sifton) should undertake this needless expense in connection with his department, when he should have all the facts at his disposal. I would like to know a little in advance whether the minister is going to continue to dig holes just before the elections in the near future.



The MINISTER OF THE INTERIOR.—My knowledge of the geology of Prince Edward Island is not very extensive. I can only say that I received a communication from the hon. gentleman (Mr. MacKinnon) asking that this work be done. I referred the matter to Dr. Bell, and he recommended the work, and it was done accordingly. As to the details, I think the hon. gentleman (Mr. Lefurgey) will have to talk that matter over when the hon. member for East Queen's is here.

Mr. LEFURGEY.—I would like to have the hon. minister bring down the report at as early a day as possible.

The MINISTER OF THE INTERIOR.—I will bring it down at once.

"To provide for the salary of a geologist to the international

"boundary survey from July 1, 1903, to June 30, 1904, \$2 000.

Mr. INGRAM.—Is there any report from this geologist?

The MINISTER OF THE INTERIOR.—Yes, he makes his report every year. It will be found embodied in the usual publications of the Survey.

Mr. INGRAM.—Is it in one of the two large volumes given to each member of the House?

The MINISTER OF THE INTERIOR.—Yes, the regular report of the Survey. Dr. Daly is the geologist, and it is to his report that I refer:

"To provide for plotting and compiling of surveys, plans, maps and

"utilizing field-notes, &c., (persons having technical or professional

"qualifications may be paid out of this vote at rates exceeding \$400

"per annum, notwithstanding anything in the Civil Service Act, or

"any other Act), \$5,500."

Mr. BORDEN (Halifax).—There is an increase of \$1,800 in this item. Will the hon. gentleman please explain?

The MINISTER OF THE INTERIOR.—This vote is to enable us to catch up with work now in arrears. The maps were not got up as promptly as they ought to be. Since Dr. Bell took charge, to his credit be it said, he has endeavoured to get the work up to date, and this is a special vote to enable him to do so. He reports to me that this vote of \$5,500, being an increase of \$1,800 over that of 1902-3, is necessary because the vote of last year was insufficient to pay the salaries of draftsmen employed for the fiscal year. Five draftsmen are engaged, two at \$3.25 a day, two at \$3 a day, and one for eight months at \$2.75 a day, this officer being for the other four months engaged in field work and paid out of the general vote. This vote is practically to enable us to employ draftsmen and other technical officers to finish maps and plans so as to make available for the public the work the Survey has already done.

Mr. BORDEN (Halifax).—Is the work tabulated in any way by these men, or do they simply do the work from the field-notes?

The MINISTER OF THE INTERIOR.—They work from the field-notes of the technical officers.

Mr. BORDEN (Halifax).—The work the hon. gentleman (Hon. Mr. Sifton) spoke of a while ago would be further work in connection with analyzing the results and putting them in tabular form.

The MINISTER OF THE INTERIOR.—This is different.

Mr. BORDEN (Halifax).—I understand. But that work of tabulating has never been done before?

The MINISTER OF THE INTERIOR.—No. The only work of that kind that we have done has been the work that Dr. Barlow was doing last year. The work to be paid for by the vote now under discussion consists in putting in shape to be available the work of the technical officers in the field. The other work consists in collecting from the different reports of the Survey during the years it has been in existence the information which is embodied there, analyzing it, casting out what is obsolete, perhaps making re-examinations to supplement the information where it is defective, and putting the whole thing in shape where it will be practically valuable to the ordinary reader.

Mr. SPROULE.—If you are collecting this information, it can be done by these officers?

The MINISTER OF THE INTERIOR.—No. This is for technical office work necessary to make available the work done in the field.

Mr. SPROULE.—But that gives no information. The hon. minister employs two classes of men, and he proposes to take a vote of \$1,800 more than last year. That means that he will employ additional hands. What are those additional hands. What are those additional hands to work at?

The MINISTER OF THE INTERIOR.—When an officer goes into the field and makes an examination of a certain district he makes his field-notes of the work he does. When he comes back he extends those field-notes,

and then upon those field-notes are drawn the geological maps of the districts which he has surveyed. The preparation of the geological map is the work necessary in order to make available the work which the technical officer has done in the field. That is the foundation of the usefulness of the survey. That has been allowed to get behind, and we are trying to catch it up.

Mr. SPROULE.—How far are you behind now?

The MINISTER OF THE INTERIOR.—The large map of the western section has been got out, that of the eastern section we expect out very soon. The arrears in connection with the general work of the survey, I think, will probably be overtaken in a year.

## NORTH STAR.

Mr. J. L. Parker, superintendent of the North Star Silver-Lead Mine at Kimberley, B. C., reports to shareholders as follows.—

The work outlined in last year's report has been carried out and the contacts of porphyry have been kept in touch with the result that quite an appreciable amount of ore has been found, both in No. 1 and No. 2 ore channels. Whilst much of the expenditure has been on what has been surface and shallow prospecting work, yet this has been the means of finding more ore, and also of enabling the decision to be made of the best points at which deeper development could be most advantageously commenced.

Two exploratory places have been started, each pregnant with possibilities, namely, the East Incline Shaft, which is following the porphyry contact, and the North Incline, which is following the No. 1 ore channel.

As outlined in last year's report, contacts in porphyry and country rock have been kept in sight by means of gravel drifts in the mine and surface cuts, and also adit tunnels and shallow rock development on the 60 ft. level.

Whilst not finding any large deposits, the work done during the year in conjunction with the previous work has fully demonstrated the fact that the porphyry contacts possess a most important bearing on the ore deposits, and judging from the length of the principal ore shoots, and the smaller ones, which in each case were lying in contact with the porphyry dike, some very close relation between the two must exist. Drill holes were therefore placed in such a position as to prove that these dykes probably extended to the deep, and a stringer of ore was also followed down, at the north end of the No. 1 ore body, by a shaft. The information thus gained has proved that the dyke extended to the deep and that there is a possibility of further development opening up ground favorable to the deposition of ore.

This shaft, which is known as the East Incline Shaft, is 200 feet deep, and drifts and crosscuts have been driven with the result that stringers of ore have been encountered in the contact, which, whilst low grade, averaging 8 to 10 oz. silver and 23 to 38% lead, show that there is a possibility of striking something better later on. This shaft will be sunk deeper as soon as the necessary buckets, which have been ordered, have arrived.

The North Incline has been driven 250 feet, and has followed the ore channel all this distance, and good stringers of ore have been met intermittently all the way down, which have assayed as high as 90 oz. silver and 70% lead.

The total amount of development work done during the year amounts to 12,166 feet of drifting, cross-cutting, sinking, raising and diamond drilling. The work from now on will be more confined and not so scattered as last year, and will I hope be encouraging. The theory that the ore deposits were only to be found on the surface, or rather that there was small chance to find any at depth, has been in my opinion proved to be too early a snapshot judgment.

During the year 3,426 tons of ore have been shipped, the assay value of which averages 29.5 oz. silver and 36.2% lead.

In conclusion, I may state that the conditions are now more encouraging than at this time last year, and I have certainly not lost hope of more ore being found as the development work continues.

## TYEE COPPER.

Mr. E. C. Musgrave, Superintendent of the Tyee Mine, Mount Sicker, gives some interesting figures of costs at this mine during the past year's operations of the Company.

The total amount of development work done during the year has been: drifting 1,095 ft.; cross-cutting, 511 ft.; sinking, 193 ft.; and upraising,



319 ft.; and the average costs per lineal foot have been: drifting \$9.15; cross-cutting, \$6.77; sinking, \$18.31, and upraising, \$11.59.

The costs of stoping are also very small, being only an average of \$1.359 per ton, for stoping and raising to the surface, which of course includes timbering, supplies, etc.

The following table gives the costs which can be charged against the ore, and their total amounts to the small sum of \$2.173 per ton of ore, shipped.

|                                 |                  |
|---------------------------------|------------------|
| Stoping.....                    | \$1.359 per ton. |
| Proportion for exploration..... | .499 "           |
| Surface work.....               | .124 "           |
| Ore sorting.....                | .041 "           |
| Transporting to railway.....    | .15 "            |
| Total.....                      | \$2.173 per ton. |

The total tonnage delivered to the smelter during the year has been 21,565½ tons, of which 20,688½ tons was first-class ore, and 877 tons copper-bearing schists. Of the ore 2,930 tons was sent from the dump, and 17,758½ tons from the mine.

The only test of values, besides the actual smelter test has been a number of assays taken from the roast piles during the last three months, and the average of these has been; copper, 5 per cent.; silver, 3.2 oz.; and gold, .15 oz.

This grade of ore has been secured by mixing all grades from the highest to the lowest, and thus instead of following up the rich ore and taking it out, and being then left with a very large proportion of low-grade ore, it is possible, by mixing the ore, to work the mine more economically, and thus to get a greater profit on the low-grade ore than could be done if it were taken out and shipped separately. By this method the ore is broken out from wall to wall, and while the absolute waste is eliminated on the sorting belt, all the ore is shipped.

## COMPANY NOTES.

**Costs of Aerial Transmission at the Tye Mine.**—Mr. E. C. Musgrave, Superintendent of the Tye Mine, Mount Sicker, B.C., gives in his annual report to the shareholders some particulars of the aerial tramway installed last September. It is a double-rope system, and consists of a standing cable 1 in. diameter on the loaded side and ¾ in. diameter on the light side; and a hauling cable ¾ in. diameter, supported on fifty-two derricks or towers. There are fifty-four buckets, each having a capacity of half a ton, which travel on small trolleys on the standing cable, and are fastened to the hauling cable at regular intervals. The tramway works practically by gravity, receiving only a small amount of assistance from a small engine at the upper terminal. The buckets, after being dumped automatically at the lower terminal, travel up to the mine inverted, to prevent their getting filled with snow or rain, and at the upper terminal are righted and locked automatically; then go round the terminal, and take their load automatically, and without stopping. The costs of transporting the ore from the mine to the railway, a distance of 3½ miles has been 15 cents per ton, which includes all working expenses, repairs, and loading it on to the railway cars. This works out at 4½ cents per ton per mile.

**Velvet Rossland.**—The manager cables:—"Have received the following returns from smelters, namely:—187 tons first-class ore yielded 197 ozs. gold, 8,706 lbs. copper; net returns from smelters, \$3,750 or an average of £4 2s. 10d. per ton. 46 tons 'fines' yielded 17 ozs. gold, 2,250 lbs. copper; net returns from smelters, \$292, or an average of £1 6s. 3d. per ton."

**Le Roi No. 2.**—The following report has been received from the mine manager for the month of May:—"Josie Mine; 500 ft. level.—Instead of drifting we widened out towards the footwall, following the streak of ore hitherto left behind on account of its low values.—It has proved much better than anticipated. 300 ft. level.—13 ft. were driven, and we again broke through, for the second time, into the main drift, nothing but stringers being encountered. In an eastward direction 18 ft. were driven; but the ore there pinched out, and we abandoned the drift. We raised on a good showing of ore about 9 ft. west of our cross-cut. Here we got occasionally very good assays; but the ore was broken up, and we had to abandon this also. (Height of rise, 22 ft. above sill floor.) 700 ft. level.—96 ft. were driven on route of diamond-drill hole No. 27, with a view to undercut Annie No. 3 ore body. 500 ft. level.—Hanging-wall drift driven 18 ft. Some good values were encountered; but average grade of ore is second-class. Diamond-drill work.—Hole No. 27 advanced from 243 ft. to 363½ ft. but nothing met with. 900 ft. level.—Hole No. 28 run 270 ft. Nothing met with so far. No. 1 mine, 200 ft. level, west drift—20 ft. were driven. There were occasional good showings of ore, but they were hardly so good as anticipated. East drift—17 ft. were driven to meet west drift. About 5 ft. of this were in ore of milling grade. This is now spoken of as stope 11. We widened out on footwall side about 3 ft., where a streak of mixed ore occurred. 300 ft. level.—The cross-cut shown on plan was driven 11 ft. in very good ore. Ore production.—Ore has been taken from the stopes in the following proportions: Josie Mine: Stope 19, 300 ft. level, 558 tons; stope 20, 500 ft. level, 1,845 tons; stope 5, 400 ft. level, 354 tons; stope 6, 600 ft. level, 203 tons; stope 11, 700 ft. level, 175 tons; total, 3,135 tons. No. 1: Stope 10, 200 ft. level, 26 tons; stope 11, 200 ft. level, 137 tons; stope 2a, 200 ft. level, 66 tons; stope 4, 300 ft. level, 487 tons; stope 5, 300 ft. level, 12 tons; total, 728 tons; total, Josie Mine and No. 1 Mine 3,863 tons. General remarks on above stopes: Josie: Stope 19.—Back of this stope has again become badly

broken up; ore penetrating into dyke on third floor. Stope 20.—This is very good, and has improved greatly during last month. Stope 5.—We stopped shipping from here early on in the month; there is a large tonnage of ore broken, which we can draw from at any time. Stope 11.—We have also stopped shipments from here as value became very low grade. No. 1 Mine: Stope 4 is giving very good ore; another streak has been found in footwall giving very high values, and we are now following this up. Cross-cut previously mentioned is very good-looking stuff, and promises to be an important find."

**Cariboo Consolidated.**—The following report has been received by the secretary of the company, dated 25th May, from the resident manager: "I am very glad to be able to give you most encouraging information in regard to the Lightning Creek work. In sinking borehole No. 4 we encountered highly auriferous gravel having a thickness of about three feet immediately above the bedrock. The total depth of this hole to bedrock was 129 ft. In this strata of gravel we recovered between four and five hundred small colours or fine particles of gold, the largest being a flake about 1-16 in. square. As this gold is forced from the bottom to the surface through a three-inch pipe by a small stream of water, it is, of course, impossible to secure heavier colours, the velocity of the water not being sufficient to do this. It is a most remarkable showing under the circumstances, and proves that the ground we propose drifting is very rich. We are now preparing to sink borehole No. 5, distant 100 ft. from borehole No. 4, towards the south rim. In this hole we will endeavour to secure heavier gold by means of a pipe fitted with a valve in end of same, acting as a sandpump. This borehole No. 4 was the first hole in which we have struck gravel on the bedrock, showing that we must now be into the channel. By next mail I will send you the cross section developed to date, of this Lightning Creek Channel."

## POGSON, PELOUBET & CO.

## PUBLIC ACCOUNTANTS

|                 |                    |
|-----------------|--------------------|
| NEW YORK - - -  | 20 Broad Street    |
| CHICAGO - - -   | Marquette Building |
| ST. LOUIS - - - | Chemical Building  |
| BUTTE - - -     | Hennessy Building  |

Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

## Sale of Valuable Zinc Mine IN CANADA

Pursuant to the order of the High Court of Justice, for the winding up of the Grand Calumet Mining Company, there will be offered for sale by Public Auction at the Local Master's Office, in the Court House, in the City of Ottawa, in the Dominion of Canada,

**On the Sixth day of October, 1903,**

**AT 2.30 P.M.**

Mining Location 30 T, in the District of Thunder Bay, in the Province of Ontario, containing 160 acres, and known as "The Zenith Zinc Mine." The property is about twelve miles from Rossport Station on the C. P. Railway. A considerable amount of development has been done, and about 2,000 tons of ore have been extracted.

The property will be offered for sale subject to a reserve bid, and to a royalty of \$3.00 per ton on all ore to be mined thereon. With it will be put up for sale, a quantity of mining plant and machinery, consisting of engine, derricks, cables, drills, carpenter's tools, blacksmith's tools, bar steel and iron, rope, saws, stoves, &c.

A detailed inventory of the chattels, an expert analysis of the ore, and any other information may be obtained from the liquidator.

Ten per cent. of the purchase money must be paid at the time of sale, and the balance in thirty days.

Dated the 13th day of June, 1903.

**E. A. LARMONTH,**  
Liquidator,  
48 Elgin St., Ottawa, Canada.

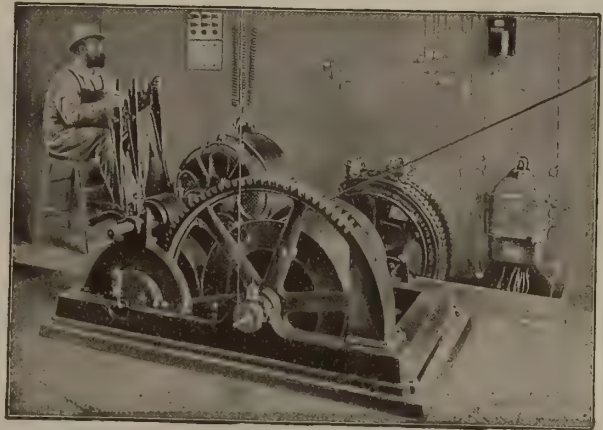
**W. L. SCOTT,**  
Local Master  
at Ottawa.



# Westinghouse Motors

For Alternating and Direct Current Service

Hoists, Compressors, Pumps and other mining apparatus, when driven by Westinghouse Motors, show in the point of attendance alone, a marked economy as compared with mechanical drive.



Westinghouse Induction Motor Driving a Mine Hoist.

Write for Circulars 1042 and 1050.

## Ahearn & Soper, Limited

Ottawa, Canada.



### ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

### CHROME STEEL WORKS,

BROOKLYN, N.Y., U.S.A.



Canada Cam.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

### THE LUNKENHEIMER POP SAFETY VALVES

for STATIONARY, PORTABLE & MARINE  
STEAM BOILERS



Brass,  
Side Outlet.



Iron Body,  
Flange End.



Brass,  
Top Outlet.

Are made of the best materials, provided with large springs, have full relieving capacity and always prompt and reliable in operation. In brass top or angle outlet,  $\frac{3}{8}$  inch to 3 inches; in iron, brass mounted, screw or flange ends, 2 inches to 6 inches. Also furnished with nickel seats, if desired. All valves rigidly tested and inspected and warranted to satisfy. Specify *Lunkenheimer* make and order from your dealer.

Write for catalogue of Superior Brass and Iron Engineering Appliances.

**THE LUNKENHEIMER CO.**  
SOLE MAKERS AND PATENTEES.

Main Offices and Works,  
CINCINNATI, OHIO, U. S. A.

Branches { New York: 26 Cortlandt St.  
London: 35 Great Dover St.

### C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO

BUFF & BERGER.

SPECIALTIES:

Standard Instruments  
and Appliances for

Mining, Subway,

Sewer, Tunnel,

and all kinds of  
Underground Work

SEND FOR CATALOGUE



# J. & J. TAYLOR

(TORONTO SAFE WORKS)

TORONTO, ONTARIO

MANUFACTURERS OF

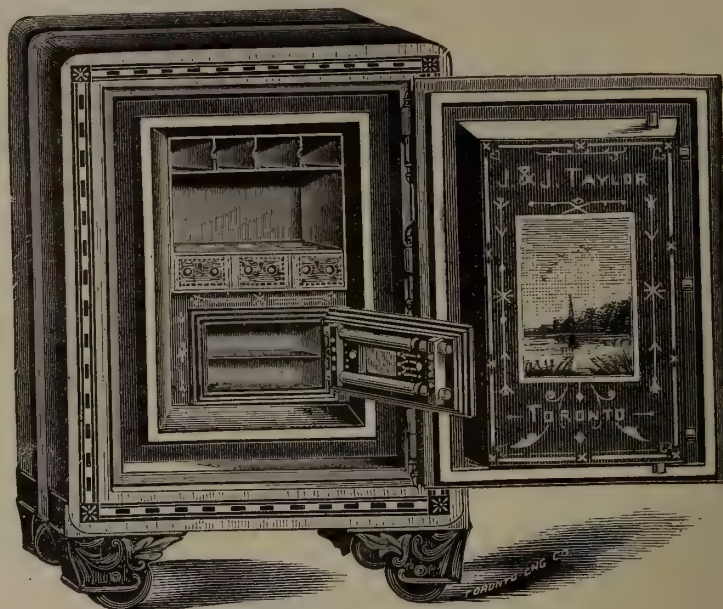
Bankers' Steel Safes

Fireproof Safes

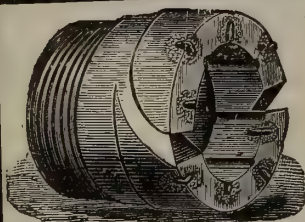
Jewellers' Safes

Vault Doors

Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



**LAURIE ENGINE COMPANY**

MONTREAL - - CANADA

# IMPROVED

# CORLISS

# ENGINES

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

FOR ELECTRIC LIGHT and POWER PLANTS.



FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

F. E. LEUSHNER,

Room 12, James Bldg., TORONTO, Canada.

**A. LESCHEN & SONS ROPE CO.**  
920-922 N. 1<sup>ST</sup> ST. ST. LOUIS, MO.

BRANCH: 92 Centre St., - NEW YORK, N. Y.  
OFFICES: 137 East Lake St., - CHICAGO, ILL.  
85 Fremont St., SAN FRANCISCO, CAL.

WIRE ROPE &  
AERIAL WIRE ROPE  
TRAMWAYS

TRAM AT BESSIE MINE, TELLURIDE, COLO.



Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

WETHERILL SEPARATING CO., 52 Broadway, New York

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P. Q.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

4 TRAINS DAILY 4  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

E. J. CHAMBERLIN,  
General Manager.

C. J. SMITH,  
Gen. Traffic Manager.

W. P. HINTON,  
Gen'l Passenger Agent.

J. E. WALSH,  
Ass. Gen. Passenger Agt.

## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

**60%** California-Nevada Mining Co.  
**PER ANNUM GUARANTEED**

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL  
MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT A 200-TON PER DAY PLANT  
READY FOR THE MILL and the CONTRACTED FOR and will be  
Hoodlum Claim, which adjoins the in full operation not later than  
Old Victor Mine, yet to figure on. April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.  
Do not fail to investigate this proposition, for the more you investigate the more  
stock you will want. Write for prospectus.

W. H. BALDWIN & CO., Brokers and Financial Agents 49-50-51-52 VOLCKERT  
BLDG., ALBANY, N. Y.

REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company,  
Los Angeles, Cal.; any mining journal of the state or prominent mining men.



## Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

### SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

### PUBLICATIONS.

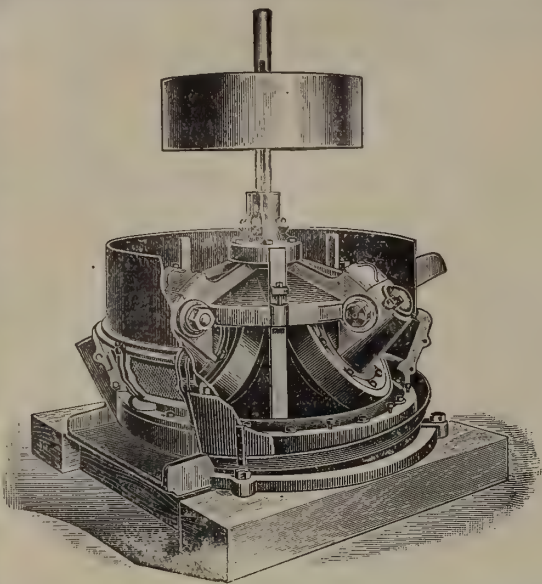
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

B. T. A. BELL, Secretary,  
Orme's Hall, Ottawa.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

MONTREAL.

Obtain our Prices.

# MINE RAILS

## Cable Hoist-Conveyors



Laurent-Cherry Patent  
Cable Hoist-Conveyor,  
Morgan Falls, Ga.

MANUFACTURED BY  
**THE TRENTON IRON CO.**  
TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.  
Also, Wire Rope Equipments for Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining  
Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated  
Canadian Mining Institute.

Vols. I, II, III and IV Canadian  
Mining Institute.

**\$20** WILL be paid for a complete  
set of these volumes. Readers  
having any, or all, of these copies for  
sale please write to

**The Canadian Mining Review**  
OTTAWA, Canada.





# The Pulsometer.

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

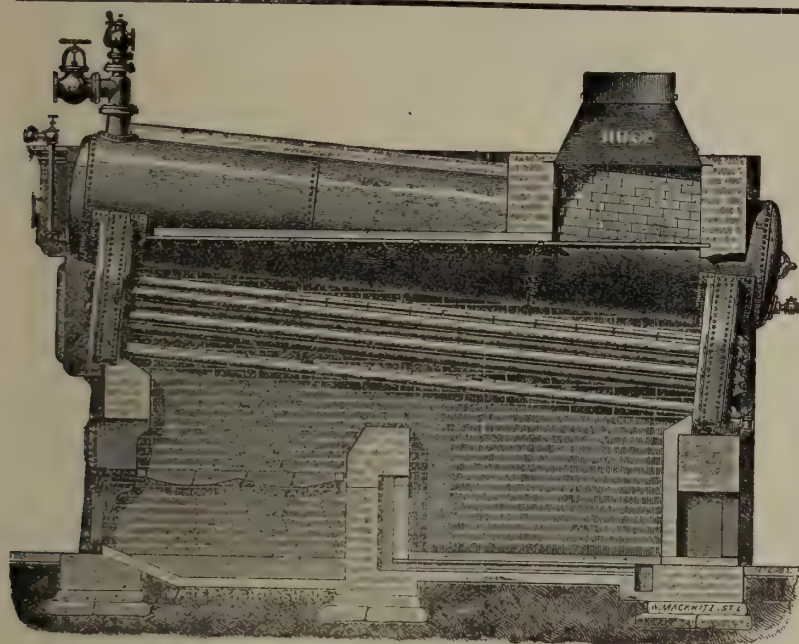
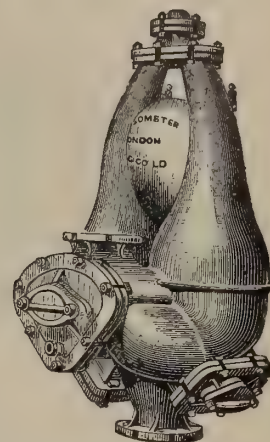
**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

NOISELESS. NOT AFFECTED BY WEATHER.  
NO SKILLED LABOR REQUIRED.  
MOST ECONOMICAL AND BEST MADE.  
NO EXHAUST STEAM. SIMPLE. DURABLE.

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL

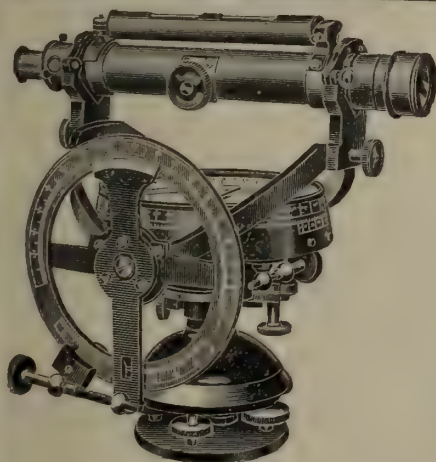


## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON."

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

**Head Office: 107 ST. JAMES STREET, MONTREAL**

Address: P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

or

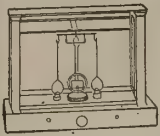
THOS. W. GIBSON,

Director Bureau of Mines,

Toronto, Ontario.



## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals

Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



**The Chemists & Surgeons Supply Co. Ltd.**

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.

**ASSAYERS and CHEMISTS  
SUPPLIES.**

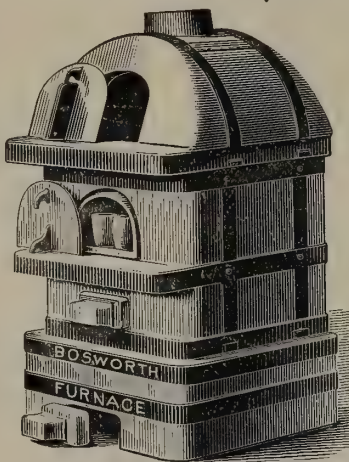
MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

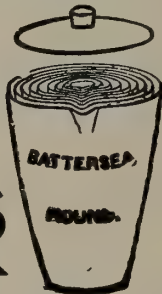
and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR  
**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.



## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

**COMPLETE ASSAY OUTFITS.**

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS.....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

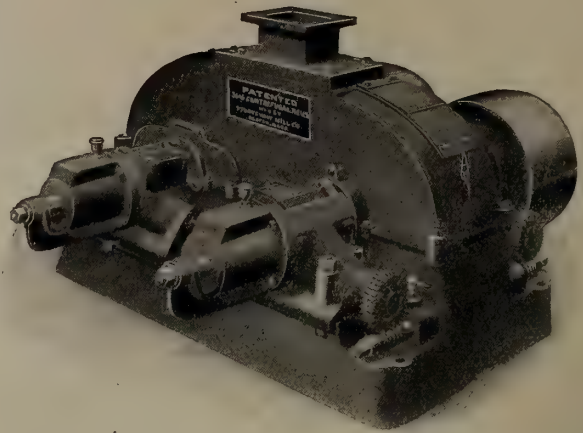
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

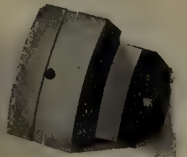
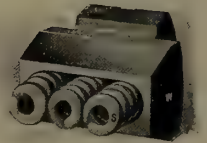
# Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.

## Centrifugal Crushing Rolls



**TIRES  
CUSHIONED BY SPRINGS**



PATENTED



Common Rolls are to spring-tired Centrifugals what the Dump Cart is to an up-to-date Rubber-tired carriage. Spring-pressed tires absorb crushing shocks. A cart, shaky enough at a walk, can scarcely hold together going faster on a road easy for a modern carriage.

If you are interested in a Roll constructed to LAST and turn out the largest product at the smallest expense, write for our catalogue of

**CRUSHING, GRINDING and  
SCREENING MACHINERY.**

# STURTEVANT MILL CO.

BOSTON, MASS.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

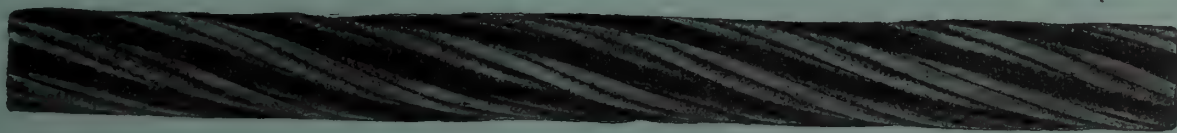


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steal Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

Montreal Pipe Foundry Co. Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

"LUDLOW" VALVES & HYDRANTS

GENERAL OFFICES:

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

CANADA IRON FURNACE COMPANY, LIMITED

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

CANADA LIFE BUILDING, MONTREAL.

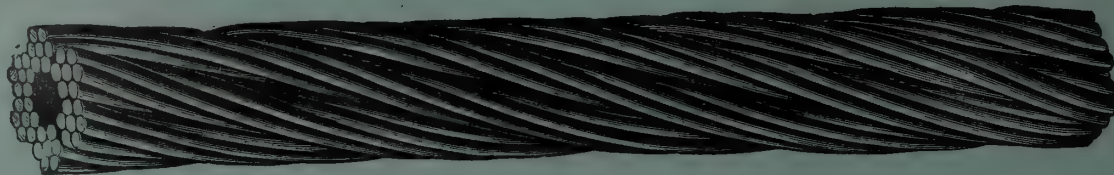
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

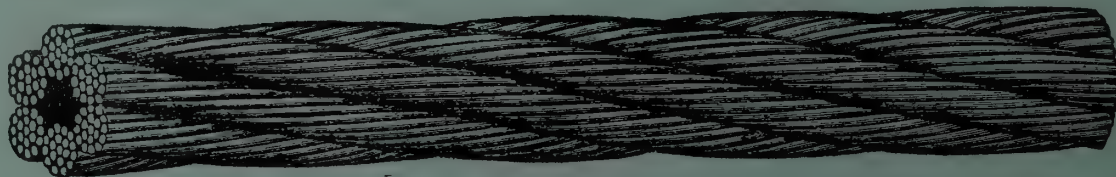
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**COOPER**

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. VIII.

OTTAWA, AUGUST 31st, 1903.

Vol. XXII—No. VIII.



**AIR  
COMPRESSORS  
GAS**

**THE CANADIAN RAND DRILL CO.**  
**SHERBROOKE, QUE.**  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



**ROCK  
DRILLS**



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

ROSSLAND, P.O. Building.



# FRIED. KRUPP GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larsio's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West  
Opposite Queen's Hotel TORONTO, ONT.

## MINING EQUIPMENT, Etc.

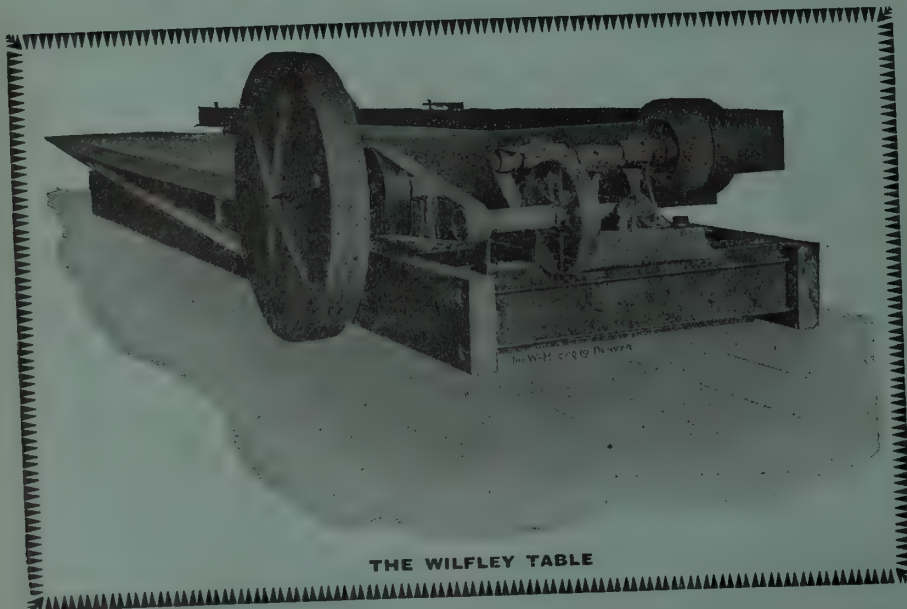
# THE WM. HAMILTON MANUFACTURING CO. LIMITED

## ENGINEERS AND CONTRACTORS

PETERBOROUGH

NELSON

VANCOUVER



THE WILFLEY TABLE

We are...

Sole Agents and  
Manufacturers in  
Canada for this  
Table.

Infringers will be prosecuted

We contract for the Design and Construction of Complete Stamp Mills,  
Concentration, Chlorination, Cyanide and Smelter Equipments.



**HADFIELD'S  
PATENT**



**MANGANESE  
STEEL**

Sole Representative of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

**PEACOCK BROTHERS,** Canada Life Building, MONTREAL.

**THOS. FIRTH & SONS, Ltd., Sheffield,**  
**Tool Steel and Rock Drill Steel**

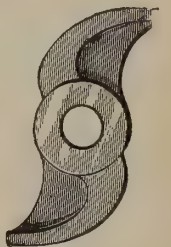
ALWAYS CARRIED IN STOCK.



**SHOES AND DIES.**



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



**H. W. DeCOURTENAY & CO.**

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

## THE GARDNER ELECTRIC ROCK DRILL

A Mechanical Drill Electrically driven.

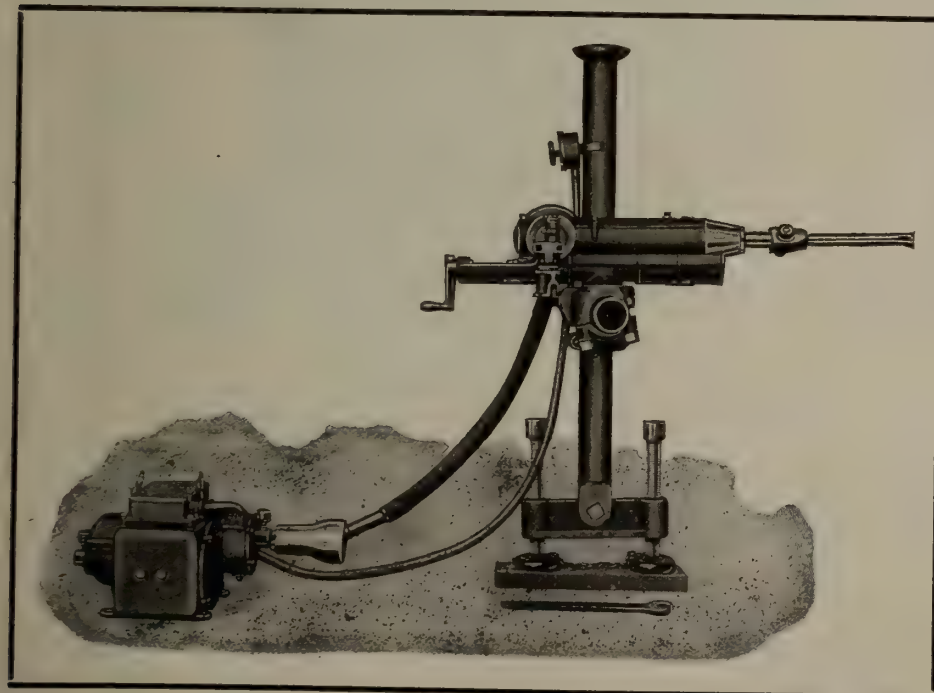
It requires less Horse Power to operate  
than Air or Steam.

No Pipes to install.

Highest possible efficiency.

Write for descriptive Pamphlets.

They will interest you.



**THE R. E. T. PRINGLE CO. LIMITED**  
**ELECTRICAL APPARATUS AND SUPPLIES**

BRANCH OFFICES:

St. John, N.B. Toronto, Ont.

Head Office and Factory:

**MONTREAL, P.Q.**



# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

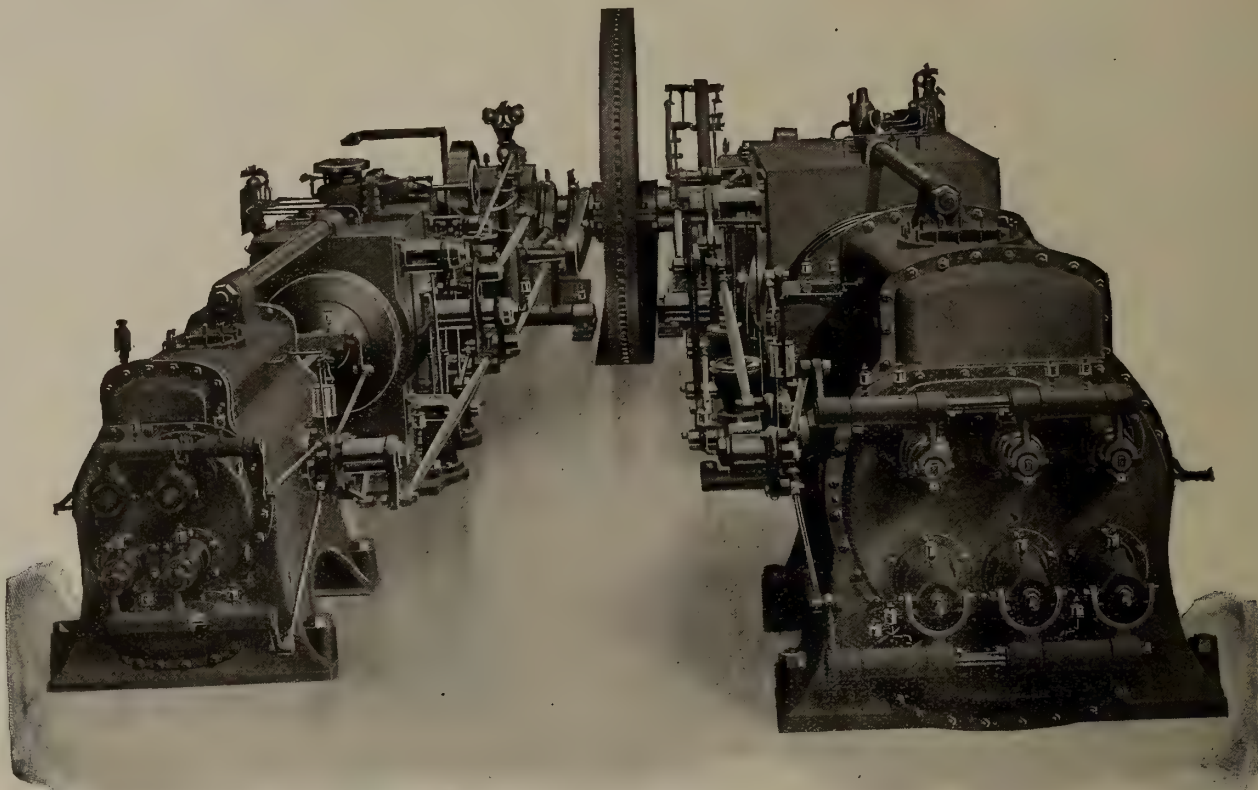
GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

BUILDERS OF

## AIR COMPRESSORS

We build high-grade air compressors for all purposes, and compressors of special design to meet the requirements of mining service. Our compressors are built in two styles, with Riedler mechanically controlled valves, and also with Reynolds automatic valves.



TWO STAGE RIEDLER AIR COMPRESSOR

The above cut illustrates a compressor built for the Anaconda Copper Mining Company, Montana, and the Broken Hill Proprietary Co., Australia, capacity about 7,100 cubic feet free air per minute.

We make a specialty of compressors arranged to be driven either by steam or electricity. We also build three and four stage compressors for unusually high delivery pressure.

We are the largest builders in the world of blowing engines for metallurgical purposes, and there are in constant operation to-day more than 200 large blowing engines of our manufacture.

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 299 S.W. Temple St.  
SPOKANE, Washington

GENERAL

CHICAGO,



OFFICE

ILL., U.S.A.

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'F'G CO.,  
SCRANTON, PA.

BUILDERS OF

## SMELTING MACHINERY



We illustrate herewith a 44 by 144 inch steel water jacketed lead smelting furnace, of the latest and most improved design.

We have furnished four of these furnaces for the Compania Metalurgica de Torreon, Coahuila, Mexico. The Allis-Chalmers Company are recognized as the most extensive builders of mining machinery in the world, and their shops are especially equipped for the economical production of copper and lead smelting machinery.

We build copper and lead smelting plants, copper converters, water jackets, hydraulic accumulators, hydraulic cars, slag pots, etc.

SOLE BUILDERS OF

### Riedler Air Compressors and Mine Pumps

### SEDERHOLM and REYNOLDS BOILERS

#### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S. W. Temple St.  
SPOKANE, Washington

GENERAL  
CHICAGO,



OFFICE

ILL., U.S.A.

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

#### BRANCH OFFICES:

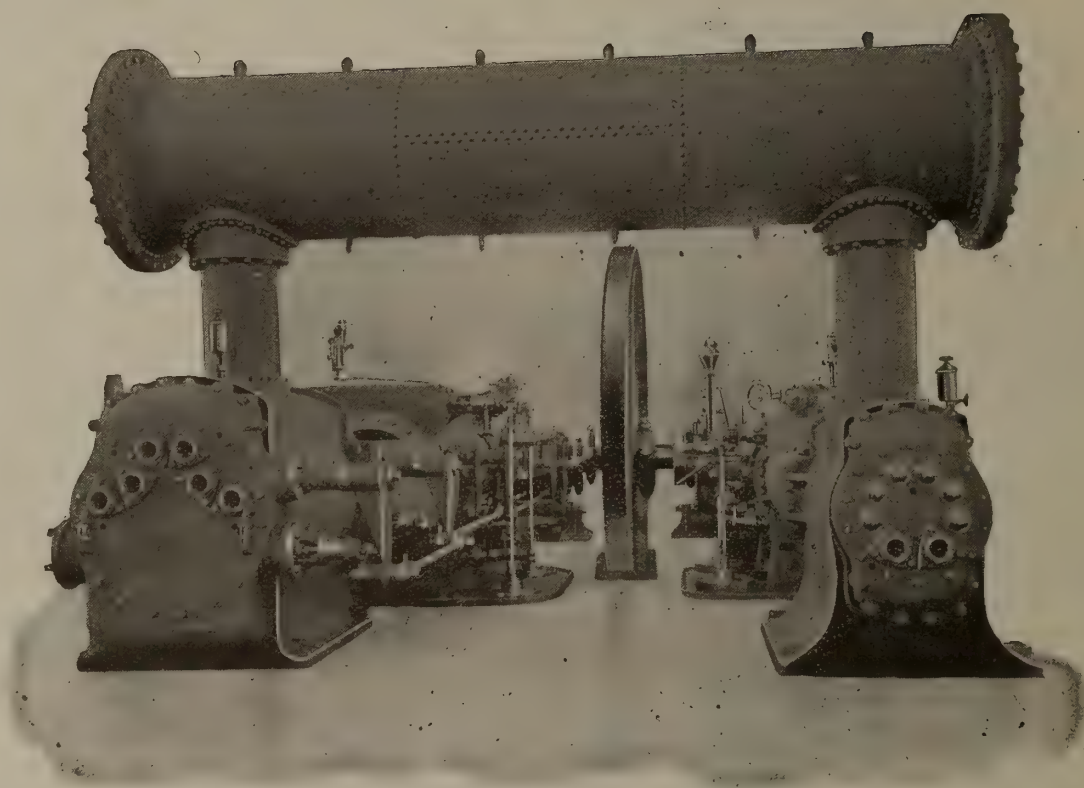
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

**The Popular Fuse Throughout the Dominion**

SOLE MANUFACTURERS

**WM. BENNETT SONS & Co.**

ROSKEAR SAFETY FUSE WORKS

**Camborne, Cornwall, England.**

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

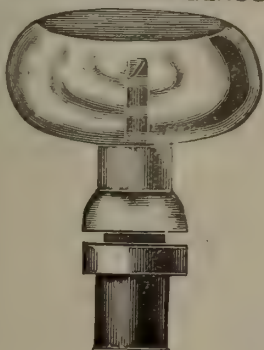
MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :-

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

**THE HAMILTON BRASS  
MFG. CO., Limited.**

HAMILTON. ONT.

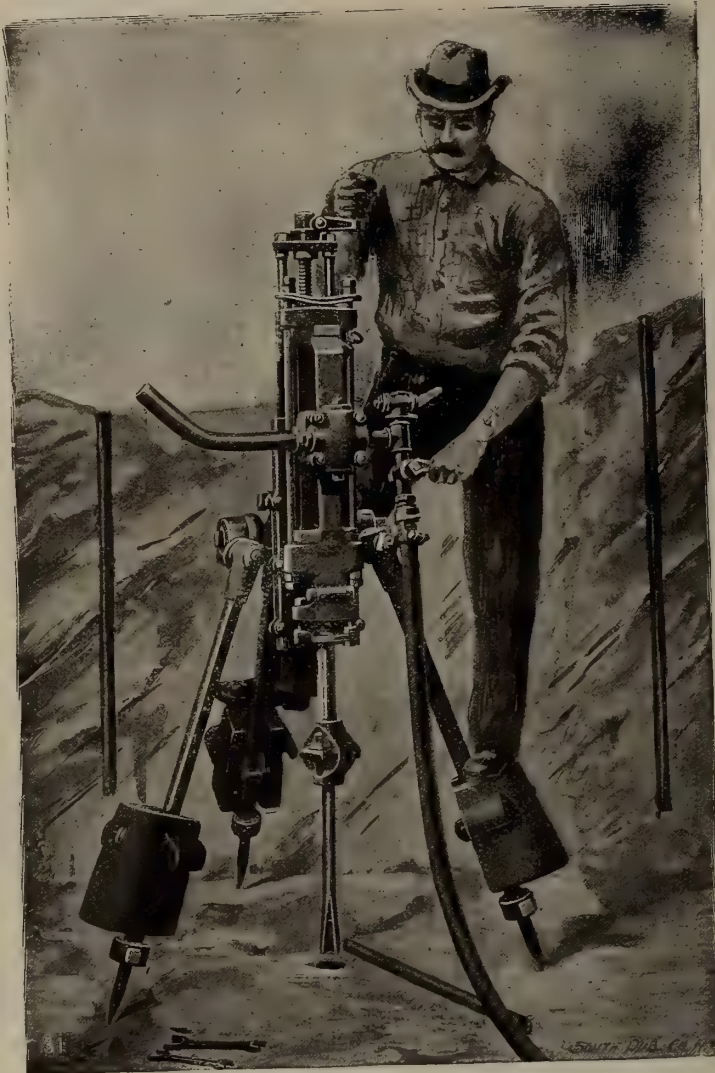


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

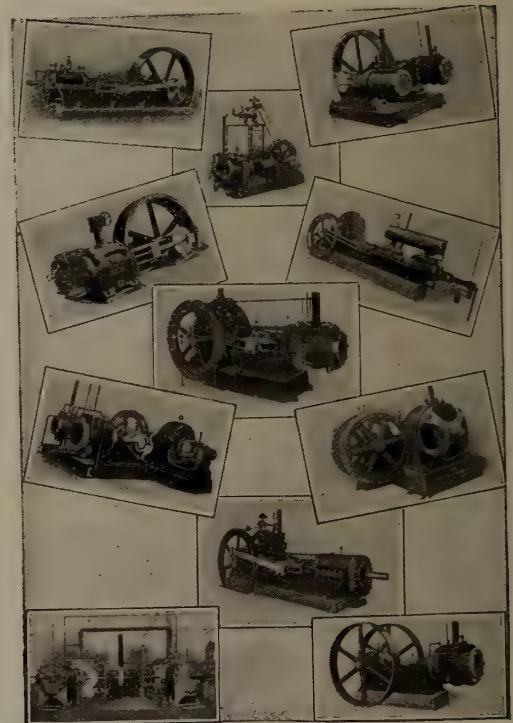
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



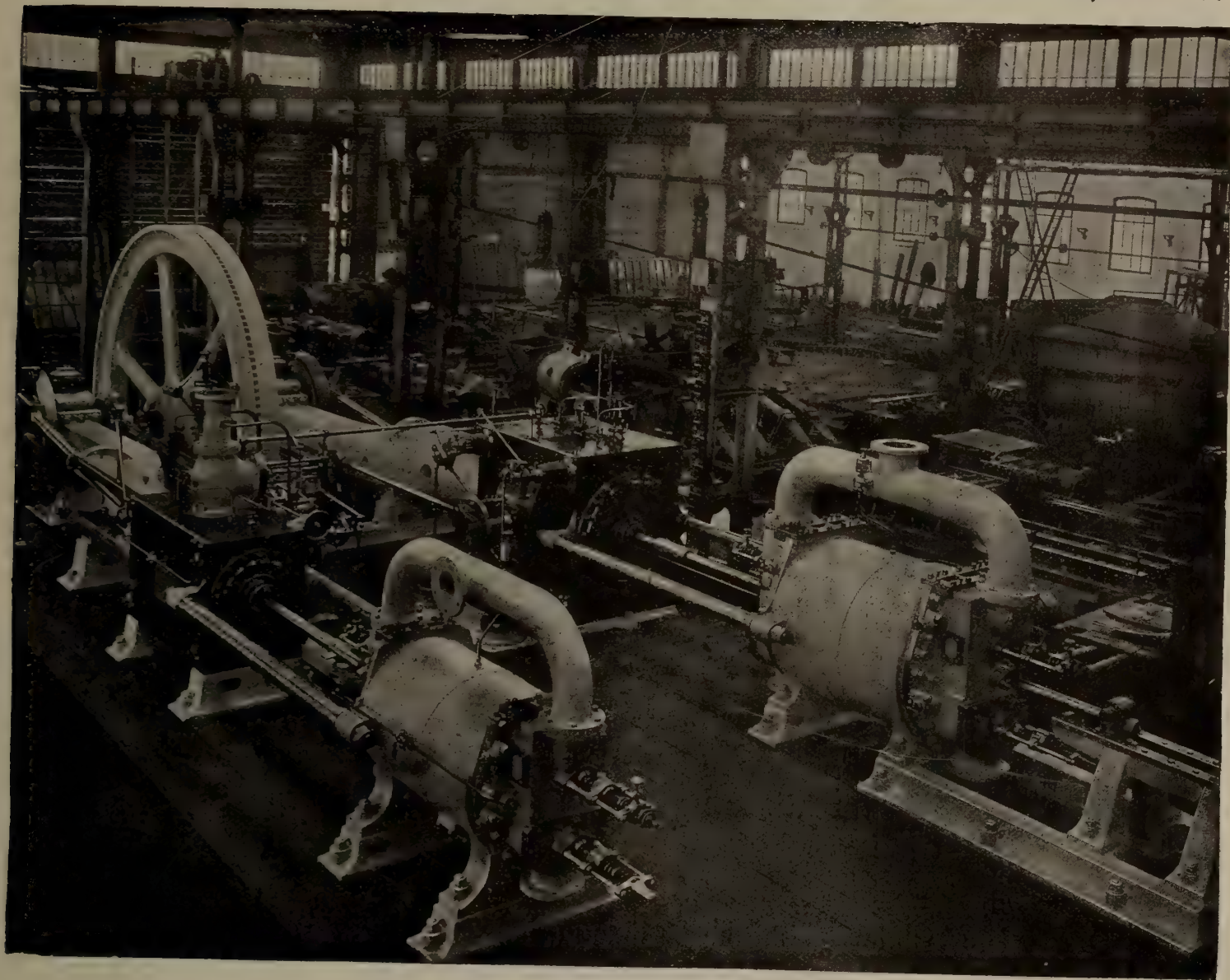


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

Messrs. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

DEAR SIRs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully.

(Signed) pro S. PEARSON & SON, E. W. MOIR.

FRANCIS T. PEACOCK, M.E., Representative for Canada... 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

....FOR....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

J. BASZANGER &amp; CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ " to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ " to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASCOW, N.S.



# DIAMOND

## DEEP DRILLING

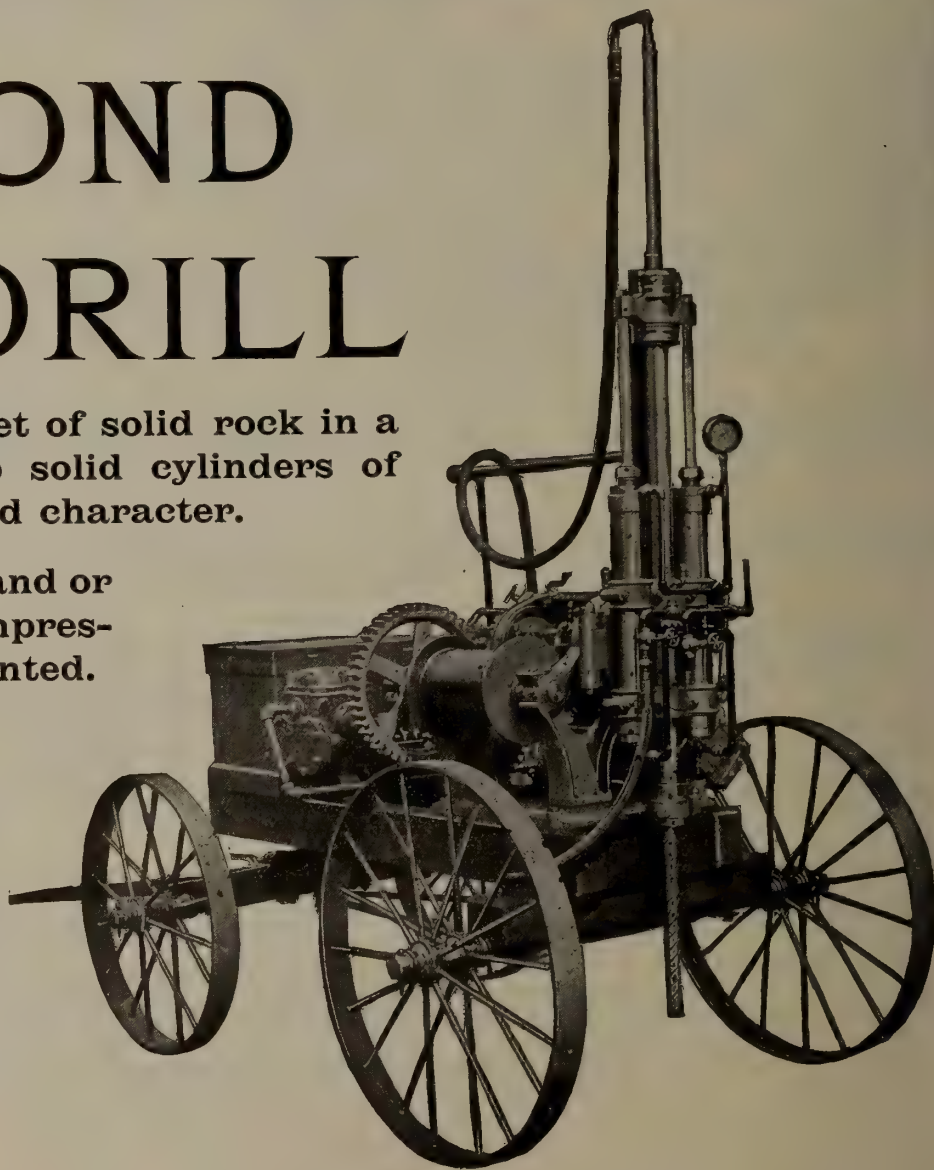
makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS

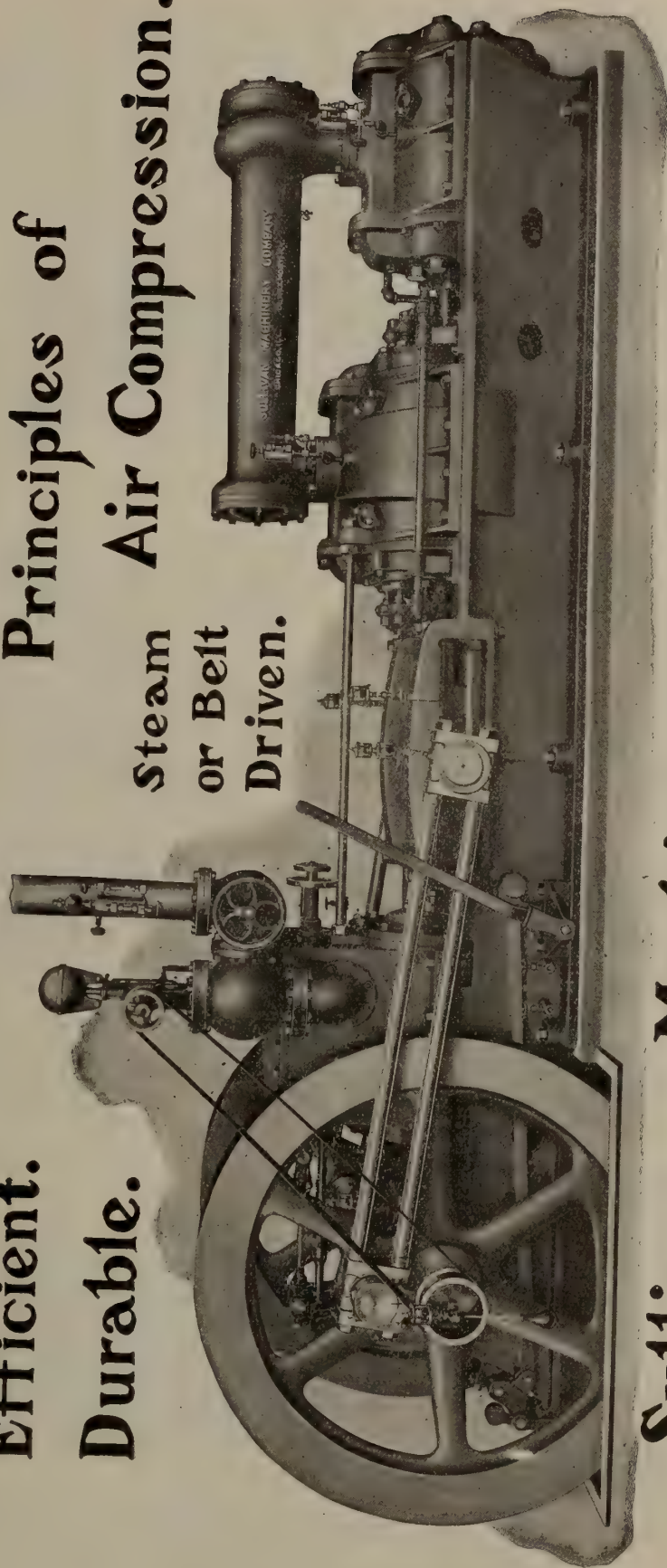


# Sullivan Straight Line Two Stage Compressors.

Simple.  
Efficient.  
Durable.

Embody the Best  
Principles of  
Air Compression.

Steam  
or Belt  
Driven.



**Sullivan**

Claremont, N.H.  
New York.  
Pittsburg, Pa.

**Machinery**

155 Adams St.  
Chicago, Ill., U.S.A.  
European Agency 25 Rue Raffet, Paris

**Company.**

St. Louis, Mo.  
Denver, Colo.  
El Paso, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS:

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.



SHIPPING PIER AT GRANTON, PICTOU HARBOUR, N.S.

## Head Office: MONTREAL, Que.

JAS. P. CLEGHORN,  
 President.

CHARLES FERGIE,  
 Vice-Pres. & General Manager.

D. FORBES ANGUS,  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### MINERS OF

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

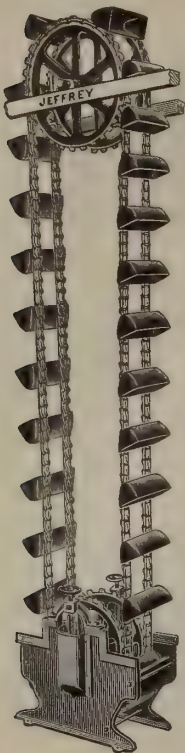
KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.





# JEFFREY ELEVATORS

DESIGNED TO SUIT THE CONDITIONS

We also manufacture a Complete Line of

## ELECTRIC MINE LOCOMOTIVES

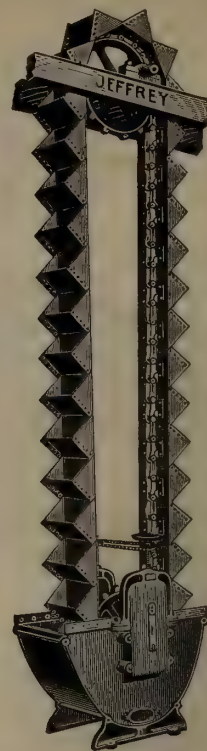
COAL CUTTERS

Power Drills

Screens

Crushers

Conveyors, Etc.



JEFFREY LOCOMOTIVE HANDLING ORE CARS.

Address

**The Jeffrey Manufacturing Company**

Columbus, Ohio, U.S.A.  
41 Dey St., New York.



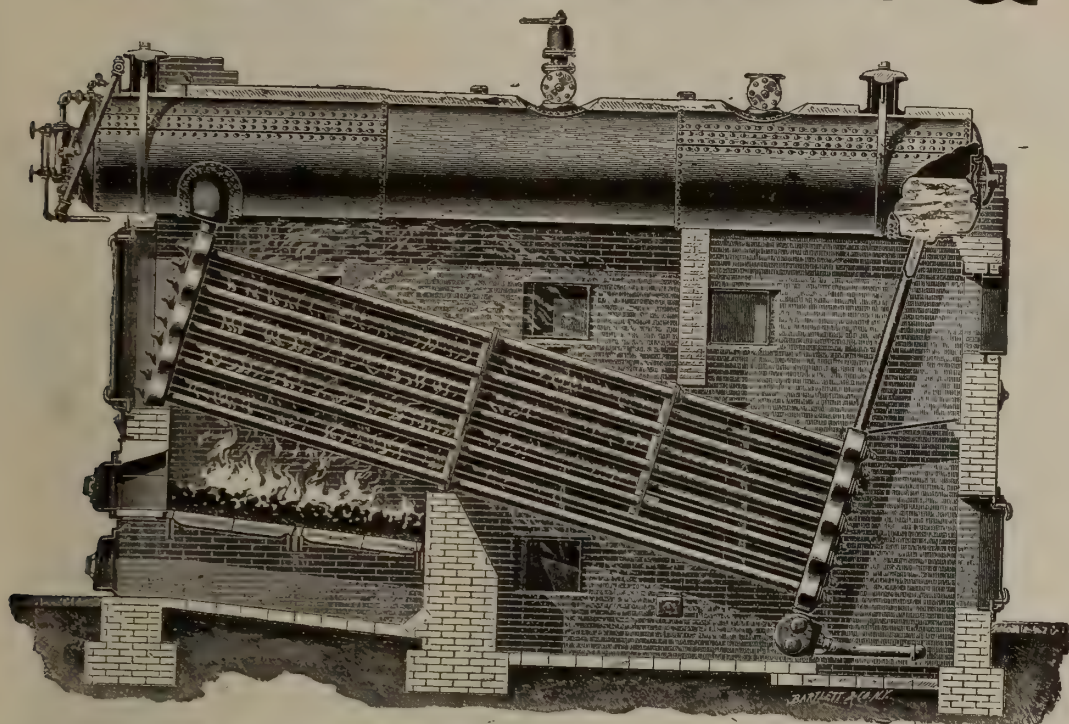
**WILLIAMS & WILSON**  
MONTREAL AGENTS

NEW  
CHAIN  
CATALOGUE  
NOW READY  
SEND  
FOR COPY





# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY  
GEARS, PULLEYS, HANGERS  
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

Blasting Machines.

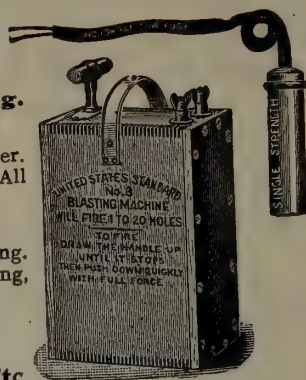
The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.



SEND FOR  
CATALOGUE

JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.

## Hamilton Powder Company

### Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

## DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.

C. A. MACPHERSON,  
Sec.-Treas.

ONTARIO POWDER CO. Limited

176 ONTARIO STREET

Kingston, Ont.

### Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P.Q.

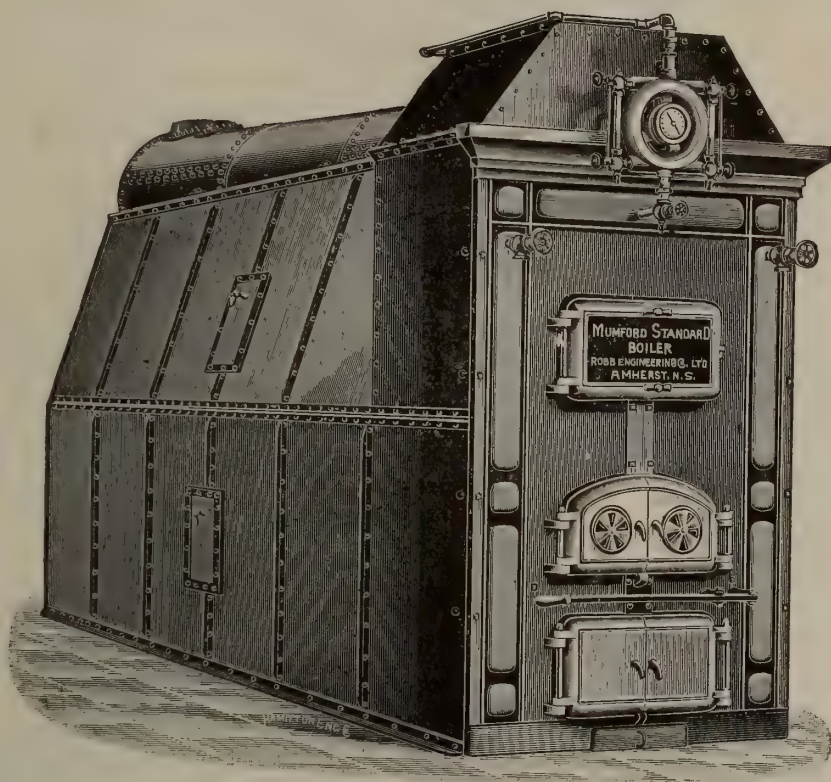
## MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works. **OTTAWA**



# A Decided Difference in the Coal Bill....



By using the MUMFORD STANDARD BOILER instead of a return tubular there will be a reduction in the coal bill of 10 to 25 per cent.

If you require a boiler it will pay you to consider the merits of the Mumford. Catalogues with full particulars will be sent on application.

**Robb Engineering Co. Limited**  
Amherst, N.S.

AGENTS : WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN
 

GROUP I.

  - (a) Mining Engineering.
  - (b) Chemistry and Mineralogy.
  - (c) Mineralogy and Geology.
  - (d) Chemical Engineering.

GROUP II.

  - (e) Civil Engineering.
  - (f) Mechanical Engineering.
  - (g) Electrical Engineering.

GROUP III.

  - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

**Next Session begins  
Sept. 30th, 1903.**

**MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

**The Secretary, School of Mining, Kingston, Ont.**



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

1903

THIRTEENTH  
YEAR

BY

**B. T. A. BELL**

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

A Complete  
Directory  
to all  
Canadian  
Collieries

Blast Furnaces

Mines

Quarries

Mills

Smelters

and

Mineral

Producers

Endorsed

by the

Canadian

Mining

Profession

Authentic  
Information  
Concerning  
their  
History  
Organization

Capital

Dividends

Accounts

Operations

Statistics

Plants

Labour

Approved

by the

Mining

Financial

Press

This standard work of reference to Canadian Mining under-  
taking and active industries is now printing and  
will be issued in July.

## A COMPLETE MINING DIRECTORY

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces

For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

Subscribe  
for it.

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

Advertize  
in it.



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

LOBNITZ & CO., LIMITED,  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.  
**GOLD DREDGERS.**  
ALL PARTS MADE TO GAUGE.  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

It Saves Steel,

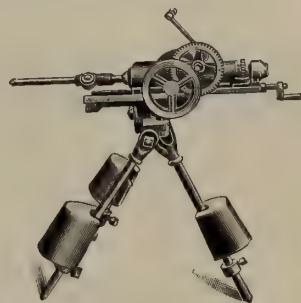
It Saves Labor,

It Saves Money.



Write for Catalogue.

JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.



## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.

This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



# THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

## STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



## HENRY BATH & SON,

London, Liverpool and Swansea,

**BROKERS.**

All Description of

**Metals, Mattes, Etc.**

Warehouses, Liverpool and Swansea.

Warrants Issued under their Special Act of Parliament.

**NITRATE OF SODA.**

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .

Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN

Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.

Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE

DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

**The Canada Company**

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,

Scheelite,

Wolframite,

Chrome Ore,

Nickel Ore,

Cobalt Ore,

Cerium, and

all Ores

and

Minerals

Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.

ADVANCES ON SHIPMENTS.

CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

**GEO. G. BLACKWELL, SONS & CO. LTD.**  
THE ALBANY, LIVERPOOL, ENG.

## LEDOUX & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### POHLEE & PARMALEE ASSAYERS and CHEMISTS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical work or processes.  
General Commercial analysis. Thirty years experience.  
Prices and sample sacks free on application.

1627 Champa St., Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA

CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street

TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc. (McGill)**

CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street MONTREAL

**ASSAYS OF ORES.**CHEMICAL AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

**RAT PORTAGE - - - ONTARIO.**

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.

8-KING STREET-8

MANCHESTER, ENGLAND.

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

**Rat Portage, Ont.**Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

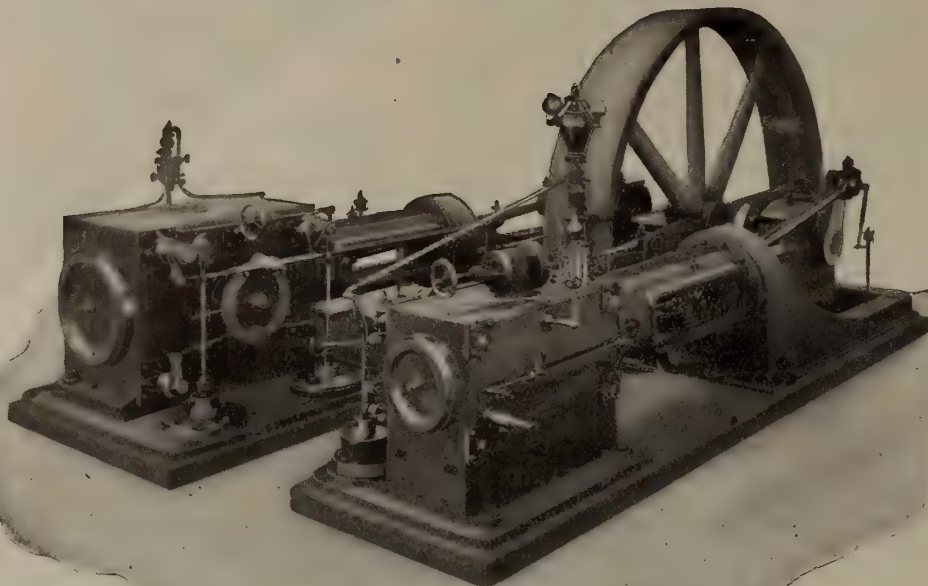
GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

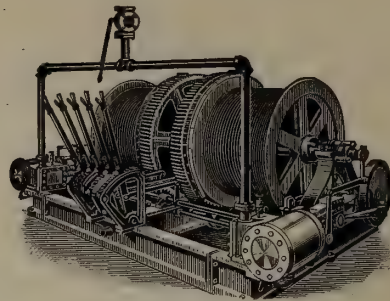
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels  
for Dredging, Dykeing, Ditching, GOLD  
MINING, Etc., of various Styles and  
Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



## WIRE ROPE

All kinds and sizes, and for all purposes.

Standard and Lang's Patent Lay.

PRICES RIGHT. PROMPT SHIPMENTS.

**The B. Greening Wire Co. Limited**

HAMILTON, ONT.

MONTREAL, QUE.

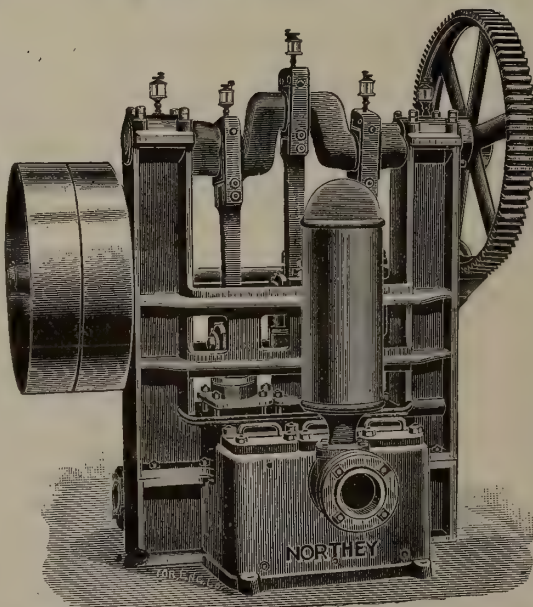
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 7.

AUGUST, 1903.

VOL. XXII., No. 7.

## Iron Ore and the Tariff.

The position of iron ore in relation to the tariff arrangements between Canada and the United States is very unsatisfactory, and bears heavily against the development of our iron mines. American ore is admitted into this country free of duty, while a tax of forty cents per ton meets Canadian or other foreign iron ores going into the United States. Hitherto a large part of the ore smelted at Canadian blast furnaces has been imported from the other side. It is easy to see why this should be the case. The immense deposits on the Vermilion, Mesabi and other ranges south of Lake Superior are easily worked, of superior quality, conveniently situated for transportation purposes, and the methods of mining and conveying them to the furnaces are organized and systematized to the last degree. Against the competition of Lake Superior ores, which can be delivered say at Ontario lake ports almost as cheaply as at Cleveland or Buffalo, it is difficult for the iron mines of eastern or western Ontario to make headway, since the demand in this country is necessarily limited as yet and insufficient to sustain even one large mine turning out ore upon a scale equal to that common in Minnesota or Michigan. The expenditure for railways, docks, ore pockets, etc., to say nothing of the cost of opening up the ore body itself, is enormous in the case of a great iron mine, and with the home market open to American ore, and that of the United States closed or open only on paying a fine of forty cents per ton, the owners of Canadian mines justly complain of the unfair and discriminatory conditions against which they have to contend. It is possible, as is proven by the exports of ore from the Helen mine, to send iron ore from Ontario to the States, but the profits must be small, since the price realized must be less than that current for American ore by nearly the full amount of the duty.

Again, in eastern Ontario the iron mines, which are comparatively small, are handicapped by freight rates to lake ports and smelters, and find themselves unable to supply furnaces with ore at prices equal to those for which Lake Superior ores can be laid down.

The remedy is reciprocity of tariffs with our southern neighbors. Either there should be free entry for Canadian ores into the United States, or a duty should be imposed on American ore equal at least to that paid by ore from this country imported into the States. The former would probably be preferable. While not tending to increase the price of ore to the smelters, it would allow of mines being worked whose present distance from a furnace renders their operation unprofitable, but which could market their output across the border. There is little doubt that if the ores of eastern Ontario were open to be pur-

chased freely by Pennsylvania furnace-owners, there would be a recrudescence of iron mining in that part of Canada, where it has once more gone to sleep. Free ore would preserve to Canadian furnaces their present breadth of choice, and leave them perfectly free to bring in whatever classes of ore they require for mixtures or for their special products, while free ore could not possibly injure the American mine-owner or bring down the price of ore in the United States market.

But if reciprocal freedom is not to be had, common fairness demands a duty on foreign ore coming into Canada. It is surely unjust to Canadian mines that their product should be fined on seeking a purchaser in the United States while American mines compete with them at home without let or hindrance. Again, an industry which receives such substantial assistance from the government by way both of bounties and protective duties as does the iron smelting industry could not reasonably complain if the owners of iron mines were to ask for the removal of what is undeniably an injustice, and to demand that some degree of recognition be accorded their product.

The bounty on iron ore mined and smelted in Ontario, paid by the government of that Province, is based on the pig iron product of the ore, and is limited to \$25,000 per annum. Hence, the sum payable per ton of ore is variable, being for each of the last two years about 25 cents per ton. This is the only share the producer of iron ore has in the whole scheme of government encouragement, Provincial and Dominion, and it has not proven sufficient to counteract the effect of free entry of American ore. As a matter of fact, the ore bounty goes mainly to the furnace companies, who oblige the mine-owner to assign his claim thereto before buying his ore.

It is not conceivable that a small duty on iron ore would increase the price of pig iron, the cost of which is regulated by the expense of laying down the imported article. But undoubtedly the better arrangement would be to procure free entry for Canadian iron ore into the United States market. Whether the High Joint Commission when it meets again—if it ever does meet again—will agree upon this, time only will tell. If it do not, the only thing open for Canadian mine-owners will be to agitate for a duty upon iron ore from the States, equivalent to that now levied on Canadian ore going into that country.

Mr. F. H. Clergue has recently been in London, England, in connection with the floating of bonds for the projected railway from Scotia Jct., to Sudbury, Ont., to be constructed by the Canada Central Ry. It is understood that although he proposes devoting the whole of his time to the interests of the new company, he will continue to act as a director of the Consolidated Lake Superior Company.



### Malay Tin and Ontario Nickel.

Although free trade is the traditional policy of British governments, a contrary course can be promptly taken if self-interest demands it. A signal proof of this has recently been given in an out-of-the-way corner of the world, where, though the country is not strictly speaking, British territory, the administration is in British hands.

The Malay States, or Straits Settlements, is now the principal source of the world's supply of tin, furnishing some 46,000 tons out of the 75,000 tons annually used. The remainder comes chiefly from the Dutch East Indies, Bolivia, Australia and Cornwall. Tin in the Malay peninsula is found mainly in alluvial deposits; it is worked chiefly by Chinese miners, being recovered by methods similar to those used for placer gold, and the local government derives a very considerable revenue from an export duty levied on the metal. The ore is dressed and smelted at Singapore, and is exported in this condition, some 70 per cent. of the output going to the United States.

An American syndicate has been formed, backed by some of the strongest financiers in the United States, to buy the tin ore of Malaya, ship it to New York, and there treat and smelt it for the home market. The tin mines at Harney Peak and elsewhere in the United States having proven abject failures, the syndicate's policy, following the usual American practice, would be after establishing a tin smelting industry, to agitate for a protective duty which while admitting tin ore free would be sufficient to keep out the product of tin smelters elsewhere. The consequence would be that the Singapore smelters would lose their American trade, and would have to go out of business. This would leave the American syndicate in full possession of the field in Malaya, where they would be the only purchasers, able to fix the price to suit themselves. The miners would suffer, the Straits Settlements would cease to be the great distributing centre for the tin trade of the world, and the government whose export duty is arranged on a sliding scale, according to the price of tin, would lose heavily in revenue.

Under these circumstances the government of the Federated Malay States has imposed an export duty on tin ore of \$30 per pikul (133 lbs.) in addition to the tax already in force. This regulation came into effect 1st June last, and the result is expected to be to preserve the tin dressing industry to the Settlement, and to protect the tin miners and the government from the disasters to which an American monopoly in tin smelting would expose them. Whatever the event may prove to be, the incident is significant of the new spirit abroad in British finance, for the home government and especially the Colonial Secretary, Mr. Chamberlain, in whom the management of the Crown colonies is vested, must be regarded as responsible for the action which has been taken.

A parallel suggests itself between the tin of the Malay States and the nickel of Ontario. The latter Province produces nearly as great a proportion of the annual output of nickel as the former of tin. The known sources of supply of nickel are even fewer than of tin. Neither metal is produced in the United States, and that country is the principal market for Ontario nickel as well as for Malay tin. In the case of nickel, however, the refining process is already established in the United States, which admits nickel ore and nickel matte free of duty, but imposes a tariff charge of six cents per pound on refined nickel.

The apprehensions of the Malayan authorities as to the probable course of events are doubtless well-founded, and there are those who would apply the principles of their legislation to Ontario nickel, and who declare that the metal should be allowed to leave the country in the refined state only. Power to impose an export duty of ten cents per pound on nickel contained in ore and matte has been placed by

the Dominion Parliament in the hands of the government of Canada, and the Legislature of Ontario has enacted laws looking to the same goal, namely, the refining of nickel in Canada. Up to the present time these powers have in both cases remained unused, and there is no sign of their being brought into play. Indeed, the effect of employing them is open to doubt. New Caledonia can supply nickel ore, and probably would do so were Ontario matte prevented entering the States, unless the French authorities should take a leaf out of Chamberlain's book, and impose a duty on outgoing ore in the hope of establishing a smelting and refining business in the colony, where, however, there is little free labor to operate it or to receive the benefit.

As it is, it is very questionable whether anything is to be gained by a restrictive nickel policy. The Sudbury mines are the backbone of Ontario's mining industry, the ore is now roasted, smelted, and re-smelted to a rich matte, and the only part of the refining process performed abroad is the final act of separating the nickel and the copper from the impurities in the matte—a step not involving much labor or expenditure of money. It may be at once admitted that the duty on refined nickel going into the United States is invidious to a degree, seeing there is no native nickel to protect, and the aim can only be to secure the business of refining for that country. At the same time, if retaliation would lead to a closing of the nickel mines of Sudbury, the luxury of cutting off one's nose to spite one's face might be purchased too dearly.

### Radium.

The properties of the newly discovered substance, radium, do not seem as yet to be thoroughly understood, and a good deal of nonsense has been talked and written about it. It has been stated that its characteristics are such as to render a re-writing of chemistry textbooks necessary by doing away with the list of "elements" to which we have been accustomed, and reducing everything in the final analysis to one common form of matter. But without resorting to exaggeration, radium is sufficiently extraordinary, largely, it appears, because the properties which it possesses in common with certain other substances, only in much greater degree, are capable of being utilized with little waste, whereas in most of the common methods of producing energy, the waste far exceeds the useful effect. For instance, in the burning of coal to convert water into steam for the production of power, the unavoidable loss from radiation, friction, etc., is very great. All known illuminants, even the incandescent gas-light, transform only a comparatively small proportion of the energy they consume into the desired form, the greater part being wasted as heat. On the other hand, as we are assured by a competent scientist, "a small fraction of an ounce of radium properly employed, would probably provide a good light sufficient for several rooms, which, at any rate during the present century, would never need removal." This surprising effect is produced by the intervention of certain phosphorescent substances which are very efficient media for converting the energy of radium into visible light.

The secret of the tremendous energy of radium is the stream of minute particles with which it is constantly bombarding everything within reach, a grain of it being capable of belching forth these projectiles at a rate calculated to be between ten and a hundred million per second, and of keeping up this discharge for many centuries. If a means could be found of concentrating this output of energy, that is of increasing the rate at which the emanations are given off so as to get the results in weeks or months which are now spread over hundreds of years, the feats that could be wrought by radium would surpass those accomplished by Aladdin's lamp. Potentially,





MR. B. T. A. BELL,

Editor of THE CANADIAN MINING REVIEW, who is now *en route* for Dawson as Commissioner to enquire into the Treadgold Concessions.



the energy stored up in one gram of radium is sufficient to raise 500 tons a mile high, consequently an ounce would suffice to drive a 50-horse power motor car round the world at the rate of 30 miles an hour.

No such things, however, are likely to happen, for there seems to be no possible way of controlling the store of energy in radium or to liberate it at a desired rate. Another difficulty in the way of realizing dreams of this kind is the very small quantity of radium which appears to exist. Not only are the substances from which it can be obtained few in number, but from its very nature, the quantity is diminishing all the time through the atoms which it is throwing off, hence what is now left is probably only the remnant that has survived this process of disintegration, which has been going on through ages of geological time.

There are other allied elements, such as uranium and thorium, which partake of the nature of radium but which give off their energy at a greatly slower rate. Consequently, they are much more plentiful, and some of them now play a highly useful part in providing the world with incandescent light. The principal source of radium at present is pitchblende, which probably does not contain more than one ten-thousandth per cent. of the substance.

An impure variety of pitchblende, called caracite, it may be remarked, has been reported from Lake Superior.

#### Imports of Mining Machinery.

The imports of free and dutiable mining and smelting machinery for the first six months of the present year compared with 1902, are as follows:—

| MONTHS         | 1903      |          |          | 1902    |          |         |
|----------------|-----------|----------|----------|---------|----------|---------|
|                | Free      | Dutiable | Total    | Free    | Dutiable | Total   |
| January .....  | \$ 77,298 | \$ 7,676 | \$84,974 | 92,984  | 2,549    | 95,533  |
| February ..... | 30,106    | 1,587    | 31,693   | 43,123  | 2,380    | 45,503  |
| March .....    | 83,535    | 11,534   | 95,069   | 55,255  | 2,629    | 57,884  |
| April .....    | 104,967   | 4,638    | 109,605  | 61,227  | 5,087    | 66,314  |
| May .....      | 155,493   | 1,469    | 156,962  | 90,820  | 4,782    | 95,602  |
| June .....     | 155,387   | 6,707    | 162,094  | 77,270  | 5,293    | 82,563  |
| Total .....    | 606,786   | 33,611   | 640,397  | 420,679 | 22,720   | 443,399 |

The principal sources from which this machinery has been imported during 1903 were:—

| MONTHS         | UNITED STATES |          | GREAT BRITAIN |          | Other Countries | TOTAL    |
|----------------|---------------|----------|---------------|----------|-----------------|----------|
|                | Free          | Dutiable | Free          | Dutiable |                 |          |
| January .....  | \$75,235      | \$ 7,676 | \$ 417        | —        | \$1,646         | \$84,974 |
| February ..... | 29,467        | 1,587    | 639           | —        | Nil             | 31,693   |
| March .....    | 82,680        | 11,534   | 158           | —        | 697             | 95,069   |
| April .....    | 104,902       | 4,638    | 65            | —        | Nil             | 109,605  |
| May .....      | 155,127       | 1,263    | 366           | 206      | "               | 156,962  |
| June .....     | 152,517       | 6,579    | 2,034         | 128      | 836             | 161,094  |
| Total .....    | 599,928       | 33,277   | 3,679         | 334      | 3,179           | 640,397  |

#### Imports of Wire Rope.

The following table shows the imports of wire rope and cables for the six months ending June 30th, 1903:—

| Month                              | From Great Britain |          | From U. S. |          | Total     |           |
|------------------------------------|--------------------|----------|------------|----------|-----------|-----------|
|                                    | Pounds             | Value    | Pounds     | Value    | Pounds    | Value     |
| January .....                      | 115,646            | \$ 8,363 | 16,909     | \$ 2,210 | 132,555   | \$ 10,573 |
| February .....                     | 152,813            | 9,504    | 30,172     | 2,683    | 182,985   | 12,187    |
| March .....                        | 151,408            | 9,038    | 46,602     | 2,607    | 198,010   | 11,645    |
| April .....                        | 148,276            | 8,663    | 20,199     | 2,640    | 168,475   | 11,303    |
| May .....                          | 132,564            | 9,174    | 59,994     | 5,395    | 192,558   | 14,569    |
| June .....                         | 320,882            | 20,047   | 49,312     | 4,028    | 370,194   | 24,075    |
| Imports from other countries ..... | 1,021,589          | 64,789   | 223,188    | 19,563   | 1,244,777 | 84,352    |
| Total .....                        |                    |          |            |          | 40,272    | 2,589     |
|                                    |                    |          |            |          | 1,285,049 | 86,941    |

#### Consolidated Lake Superior.

As we go to press the affairs of this Company are not in a very enviable position. Strong efforts are being made by President Shields to get the \$12,500,000 bond issue subscribed, but the success of this appeal is at present extremely doubtful although news comes from Philadelphia that a portion of this amount, viz., \$2,500,000, has already been pledged. The hope is expressed by the management that the present holders of the stock, both common and preferred, will come forward and take a considerable portion of the new bond issue, and it is more than hinted that unless this is done it will be impossible to preserve the valuable assets of the Company to its shareholders, as once in the hands of a receiver and forced liquidation ensues it is likely to result in the entire sacrifice of the original investment.

The stock at present outstanding amounts to \$102,000,000, divided into \$74,000,000 common and \$28,000,000 preferred, and although both issues were made at considerably under par, it is none the less a fact that at one time they represented on the various exchanges a total market value of \$50,560,000. The highest price quoted for the common stock was reached in March, 1900, during which sales were made at 38½. The preferred stock reached its maximum in 1902, as in April of that year it sold as high as 80¼. On the 30th of last month the quotation on the Montreal Stock Exchange had fallen to the nominal figures of one per cent. on the common and five per cent. for the preferred, or a shrinkage in market value amounting to \$48,860,000, or roughly speaking, of 95 per cent. The magnitude of the difference between the par value of the combined issues of common and preferred stock and the nominal value of the same on the date mentioned will be more readily perceived by glancing at the following figures:—

|                                        |               |
|----------------------------------------|---------------|
| Par value of common stock .....        | \$74,000,000  |
| " " preferred " .....                  | 28,000,000    |
| Total par value .....                  | \$102,000,000 |
| Market value (nominal) July 30th ..... | 2,100,000     |
| Depreciation .....                     | \$99,900,000  |



In view of this enormous shrinkage it would seem an extremely difficult matter to induce the unfortunate shareholders to put up the extra millions required to finance the Company through its troubles, the more so as their present holdings would not be considered safe collateral for even the smallest kind of a loan. The outcome of the efforts now being made to keep the Company on a moving basis, will be awaited with interest as the extremely valuable properties, concessions and franchises now under its control are of too substantial a character to remain long undeveloped, without to a considerable degree impeding the progress of that part of our country.

### The Hooley Scandal.

"For ways that are dark, and tricks that are vain

"The nimble Hoo Lee is peculiar.

The following extract from the editorial columns of the London, Eng., *Critic*, one of the leading mining weeklies of the world and a paper which has been most persistent in exposing mining and other financial swindles, will be of interest as shewing the opinion of two members of the English judiciary, as to the methods adopted by that prince of promoters, Ernest Terah Hooley:—

If a poor man sets at nought the Bankruptcy laws, and defrauds his creditors, he is generally prosecuted; if he commits perjury, he stands a strong chance of being prosecuted; and if he be found to have been engaged in fraudulent bill transactions he is certain to be prosecuted. But Ernest Terah Hooley, the magnificent bankrupt of Papworth Hall, Huntingdon, and the Albemarle Hotel, Piccadilly, W., has been doing all these things openly for a considerable time, with an immunity from embarrassment by the Criminal authorities which has been remarkable. The company-mongering which he has engineered with his swindling associates, at the Walsingham House and Albemarle Hotel, since his bankruptcy, and the large profits which he has made thereby, and which, by the thin pretence of acting as his wife's manager, he has prevented from going to the relief of his creditors, have been notorious. His frauds in other directions, and his lying on his periodical appearances in Court as a witness, have been equally notorious. I have dealt with his bankruptcy scandal so often that I need not go into that matter at length again here and now; but I desire to draw particular attention to his appearance as a witness in one case, and his figuring in another as a party to a bill transaction which occupied the Courts this week, and which called forth strong denunciations from the presiding judges.

In the first case a Mr. Moore sought, under an agreement, to recover from Mr. and Mrs. Hooley £25, which he had paid in calls on 2,000 shares of the Nerchinsk Gold Mining Company (formerly Hooley's Siberian Gold-fields ramp), and to be indemnified against all further calls on the shares. The action came before Mr. Justice Buckley, and, after hearing the plaintiff and Hooley in the witness-box, his lordship briefly gave judgment as follows:—

The witness last in the box (E. T. Hooley) told me three things in three successive breaths. He said: "I did not know that the plaintiff had not had the Holland and Cremetti shares," "I knew he had not had the 4,000 shares, because he had not paid the guinea," and "I do not know whether he had the shares or not." I do not believe a word of his evidence, and I give judgment for the plaintiff for £25, and indemnity in respect of calls, and on the shares and the costs of the action.

No comments of mine could add to the force of these judicial remarks on Hooley.

The extremely remarkable bill transaction case was heard the following day, before Mr. Justice Darling. The action was brought by Hooley's notorious associate, Mr. James Arnold Bradshaw, stockbroker, Liverpool, (see *CRITIC BLACK BOOK*, pp. 141-142), against J. C. Kelly, of Sapphire Corundum fame, to recover a sum of money on a bill of exchange. The following abbreviated report from the "Star" gives the chief points in the case, and his lordship's scathing criticism of Hooley and Bradshaw, and their transactions:—

The plaintiff alleged that he had had to pay the bill, which was discounted by the Bank of Ireland, and he sued Mr. Kelly, the acceptor.

Mr. Hooley's name was mentioned as being at the bottom of the transaction, which occurred through the sale of some Corundum shares, and plaintiff, in cross-examination, said he used to go to the Albemarle Hotel,

where Mr. Hooley had a suite of rooms, in order to do business with him. Witness knew that at that time Mr. Hooley was a bankrupt.

His lordship: And yet he lived at the hotel. (Laughter.)

His lordship: What was the matter with the Corundum Mine?

Witness: I do not know. I think there is plenty of corundum in it, but still I think the thing was a swindle.

Continuing, witness said he found in the end that it was arranged to turn the affair into a company, in which hundreds of thousands of pounds were to be the capital. Hooley wanted 3,000 shares, and then a question of a £1,000 bill cropped up as an assistance in the matter.

Witness accepted the bill, and then transferred the 3,000 shares to Mrs. Hooley. Asked as to why he did that, witness said he presumed Mr. Hooley always acted as Mrs. Hooley's agent.

Witness was aware that the defendant refused to pay the bill in question, because he said that Hooley had committed fraud in the matter, inasmuch as the person to whom the shares were sold was not a man of substance.

His lordship asked whether the fact that Mr. Hooley was a bankrupt was the reason why his wife selected him as her agent.

Witness replied that he thought so. (Laughter.)

In answer to his lordship the plaintiff said he saw Mr. Hooley only last week in London. Mr. Hooley knew full well that the present action was being brought, and, in fact, had been subpoenaed as a witness.

Mr. Justice Darling said he was satisfied that Mr. Bradshaw was almost living with Hooley at the Albemarle Hotel. Hooley being an uncertificated bankrupt, it was quite natural that he should live at such a place. (Laughter.)

Moreover, said his lordship, he was perfectly satisfied that Mr. Bradshaw was drawn into the frauds which Mr. Hooley was carrying on. The whole making of the bill was a fraud, and the money was only paid through the process of the law. Every step taken and every document in the case was a fraud. From the inception of these matters to the present time there had been nothing but fraud.

It was astonishing that in the middle of London, the largest city in the world, a man like Hooley could, as an uncertificated bankrupt, carry on business in the way he did.

People were prosecuted for thimble-rigging, which was a comparatively innocent game, and it was astonishing to find that persons like Hooley were allowed to play with thousands, nay, millions of pounds, in the way they did.

In concluding his judgment, which he gave for the defendant with costs, his lordship said he sincerely hoped that the exposure of to-day would put an end to these transactions.

## EN PASSANT.

The new trans-continental railway should open up much fresh ground for prospectors. In northern Quebec and Ontario, as well as in the western territories and the mountain ranges of British Columbia, are thousands of square miles of virgin territory. Little is known of the possibilities of these regions, but in many places the outcropping rocks are favorable for the occurrence of minerals. It will be surprising if experience with the C.P.R. be not repeated, the building of which both brought to light and made accessible mineral deposits which are now daily adding thousands of dollars to the available wealth of the country.

It is to be hoped that the announcement stating it to be the intention of the English authorities to prosecute Mr. Ernest Terah Hooley for his share in the Sapphire Corundum swindle is well-founded. This is one of the transactions which have helped to make British capitalists look askance at Canadian mining projects. An almost wholly undeveloped corundum property in Ontario, without mill or machinery, was actually capitalized for a million pounds, most of which was coralled by the promoters and sold to the moneyed simpletons among whom Mr. Hooley chiefly operated. It is for disposing of these worthless shares and for false representations in connection therewith that Mr. Hooley is in danger of punishment. Sapphire Corundum would not be wholly without merit if it brought the meteoric career of this preposterous individual to a close.

If there was one manufacturing industry in Great Britain which was deemed hard struck by the McKinley high protective tariff, adopted by the United States in 1891, it was the tin-plate industry. Previous to that time the chief market for Welsh tin-plates was in the States, but since then the purchases have fallen lower and lower until they are now of comparatively small dimensions. The home manufacturers supply the demand. Nevertheless, the tin-plate manufacture



of Wales is to-day turning out a greater output than ever before. In 1891 the total export of tin, ternes and black plates from Swansea was 233,020 tons. In 1901 it amounted to 239,489 tons, and last year to 271,332 tons. When the American demand ceased, the Welsh manufacturers bestirred themselves, and found new markets. To Russia alone they sent in 1902 \$2,500,000 worth of plates. This they were enabled to do partly because ship-owners, sure of profitable return cargoes of wheat or petroleum, could afford to take outward shipments at low rates of freight.

It is no wonder that the free trade system, which makes such ready readjustments possible, has many staunch defenders in the old land, who fear that in following Mr. Chamberlain's lead for protection and Imperial preference there is danger of dropping the substance in grasping after the shadow.

It is hard for some people to reconcile themselves to the fact that there is no coal in Ontario—at any rate in older Ontario. With a fine contempt for the theories of the geologists some of the citizens of Wallaceburg, a town near Sarnia, have subscribed a couple thousands of dollars to bore for coal in the vicinity of that place. There is coal in the state of Michigan a few miles away, and it is argued that as there is not much difference between the levels on the respective sides of the line, there ought to be coal in Ontario also. The government diamond drill has been at work for some time, the provincial treasury bearing one-third the cost, but the results so far have not proven the geologists in the wrong. If experience the world over counts for anything, coal is not to be found below the carboniferous series of rocks, and unless the whole tribe of geologists from Logan to Coleman have been mistaken, formations of south-western Ontario are below the coal measures. It would seem therefore that the Wallaceburg people are boring in the wrong place.

Indications in the silver-lead districts of British Columbia lead to the belief that the bounty of 75 cents per 100 lbs. granted by the Dominion government on lead will bring about much activity in mining and smelting. At Trail, No. 2 lead stack is to be blown in which will smelt about 100 tons of lead ore daily. In the Slocan region the Last Chance mine is again to be a producer, the Ruth mill has been started, and the Ivanhoe has taken on an increased force of men. The Jackson, Bosun, Sunset, Wakefield and Antonie properties are to be put in commission, and the North Star will add to its output. The great St. Eugene mine at Moyie, it is likewise announced, will probably start operations again in a short time. Altogether, the bounty stimulant seems, for the time being at any rate, to be effective.

Fifty years ago aluminium was a rarity, worth as much as gold. Now, it is quoted at 35 cents per pound. Its oxide, alumina, is one of the most widely diffused and commonly occurring minerals, being a leading component in all clays and many varieties of rock. The principal source of the metal, however, is bauxite, a variety of clay rich in alumina found in some of the southern and south-western states. Aluminium is the lightest in weight of all the metals, and its likeness in appearance to silver is utilized with good effect in the manufacture of ornamental articles. Besides being light, aluminium possesses much strength, and in some of the armies of Europe cooking and camp utensils made of it have been introduced. Advantage has also been taken of its conductivity in conveying the electric current, and when copper rose in price two or three years ago, there were many who thought it likely that aluminium wire would come into general use for this purpose. Since copper has receded in value, however, it is less likely to be replaced by aluminium in the electric field. Corundum is

a much richer ore of aluminium than bauxite, but it is an exceedingly stable compound, and its decomposition and the consequent isolation of the metal has not so far been found practicable on a commercial scale. If a feasible method were found, Canada could supply the world with aluminium.

Through the courtesy of Mr. L. Vogelstein, New York representative of Messrs. Aron Hirsch & Sohn of Halberstadt, Germany, we are enabled to give the figures of the German consumption of foreign copper for the months, January-June 1903, compared with the same period of 1902-1901:—

|                   | 1903.        | 1902.        | 1901.        |
|-------------------|--------------|--------------|--------------|
| Imports .....     | 43,688 tons. | 41,524 tons. | 33,014 tons. |
| Exports .....     | 5,380 "      | 4,486 "      | 4,693 "      |
| Consumption ..... | 38,308 "     | 37,038 "     | 28,321 "     |

In the death of Mr. Thomas Chalmers, which occurred in Chicago last month, one of the pioneers in the manufacture of engineering and mining machinery, has passed away. The late Mr. Chalmers who came to America from Scotland in 1845, was one of the founders of the well known firm of Fraser & Chalmers, since merged into and now a constituent part of the great Allis-Chalmers Company, one of the largest manufacturers of mining machinery in the world. He was connected with the building of the Windy City's first system of water-works, consisting of a single pump at the foot of the Chicago River, and also installed the first steam-heating apparatus in that city, namely, in the old Dearborn school. Another public work in which the deceased gentleman took a prominent part, was in the construction of the old Illinois and Michigan canal, during which period he was one of the engineers.

#### Wabana Ores of the Dominion Iron and Steel Co.

We take pleasure in giving publicity to the following extract from a letter from Mr. W. L. Grammer, manager of the Wabana iron mine of the Dominion Iron and Steel Co., which speaks for itself:—

"In the articles on the Dominion Iron and Steel Co., Limited, in your last two numbers of the CANADIAN MINING REVIEW, Bell Island ore from Wabana mine is mentioned as running 43 per cent. of metallic iron. This is an error; and may we kindly ask you in justice to our company to correct it in your next issue.

We send you the average analysis for the four seasons that the mine has been operated by the Dominion Iron & Steel Co.:—

|                         |                         |
|-------------------------|-------------------------|
| Season 1900—Iron, 52.88 | Season 1902—Iron, 49.23 |
| 1901— " 49.79           | 1903— " 50.67."         |

#### The Synclinal or "Inverted Saddle" Reefs of the Bendigo Goldfields.\*

Whilst much has been written in past years by geologists, scientists, mining engineers, etc., regarding the well-known and justly notorious anticlinal, or, as they are more commonly known, "saddle" reefs of Bendigo, comparatively little notice has been given to the synclinal or "inverted saddle" reefs and their relationship with each other.

In taking up the question of the synclinal folds, I recognize that it is a large undertaking to confine within the limits of a short paper, and at the same time convey a comprehensive idea of their characteristics, and the importance of their relationship with the anticlinal

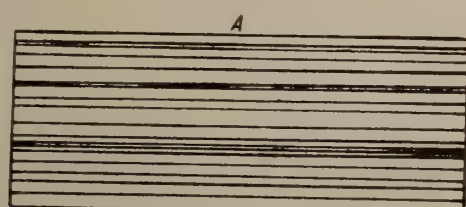
\* By WM. H. CUNDY, in Transactions Australian Institute of Mining Engineers.



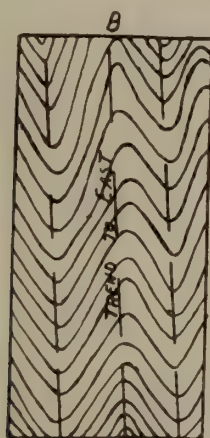
folds, in the general question of practical mining. However, from a practical point of view I consider the question of great importance, and if an interest in it can be awakened, more particularly among practical men, the object of this paper will be achieved.

Before entering into the subject, I must briefly state some facts, and perhaps some theories, in respect to the deposition of the Lower Silurian rocks, and their subsequent buckling up, as now seen on the Bendigo gold fields. At the same time, I do not intend to go very closely into the geological aspect of the question, as I wish the paper to be considered as a practical one.

It is, I think, a generally accepted theory that the rocks on this field were originally laid down in water in horizontal layers, sub-



HORIZONTAL BEDS



FOLDED BEDS

DIAGRAM NO. 1.

sequently being bent over, or roughly corrugated, probably by the granite upheaval. As an illustration I submit the following ideal diagram showing the layers or beds of rock as originally deposited, and the same rocks subsequently buckled up. (Diagram 1.)

From the present position of the rocks it is evident that the forces responsible for this buckling up exerted a very strong lateral pressure, and it is also evident that there was an endlong pressure as well, for looking at the stratification transversely it will be seen that the undulations ("dip") of the rocks are short in comparison with the longer and wave-like undulations ("pitch") when viewed longitudinally. (Diagram No. 2.)

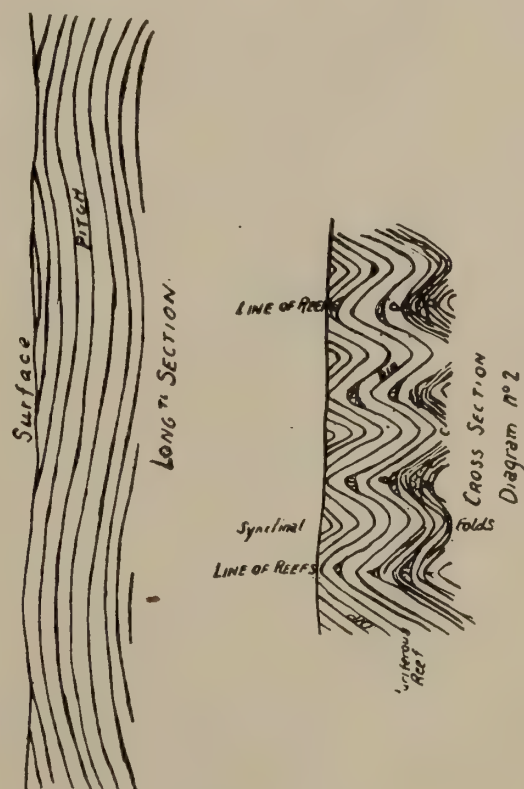
Whilst the process of bending over was in progress, it is natural to assume that the beds, or layers of beds, of rock would not be of uniform strength and thickness. Consequently, whilst the anticlinal arch and the synclinal trough were being formed the weaker ones would break. This would more particularly be the case near the surface, where the resistance would not be so great, and this fact (together with considerable faulting) may be laid down as one of the principal reasons why the reefs on the Bendigo field were not earlier recognised as anticlinal or more commonly known "saddle" reefs.

Local prejudice among mining men would not admit of the principle of the anticlinal formation until in recent years, but much more averse were the miners in regard to the synclinal fold formation. Even at the present time there are practical men of over thirty years'

experience on the field, who deny that any synclinal folds exist, simply because they have not seen them in their own mines, and are not sufficiently interested to notice them in others. I am glad to say, however, that in the last few years the practical men are evincing a greater desire to become more acquainted with the geological side of the question and applying it to practical mining. This is as it should be, for it stands to reason that without some knowledge of the deposition of the rocks and reefs, the work of laying out systematic mining operations must be attended with a large element of chance.

The result of the geological survey of the Bendigo gold fields, upon which I was engaged some years ago, under the direction of Mr. E. J. Dunn, F.G.S., disclosed the fact that transversely in a distance of  $2\frac{1}{2}$  miles there are 13 anticlinal folds along which the saddle reefs are formed, with 12 corresponding synclinal folds between them. The survey comprised an area of 20 square miles, in an oblong strip  $2\frac{1}{2}$  miles wide by eight miles long. The above number of anticlinal and synclinal folds were found within this limit, but it is well known that many others exist both to the east and west of the area surveyed. And further it must be noted that though the reefs were traced for a distance of eight miles, they continue for miles north and south of that limit. When it is considered that the bulk of the mining operations has been chiefly conducted on only three lines of reefs, the wonderful magnitude of this field is apparent, also the immense area yet to be exploited.

The anticlinal and synclinal folds have a general strike of N.  $20^\circ$



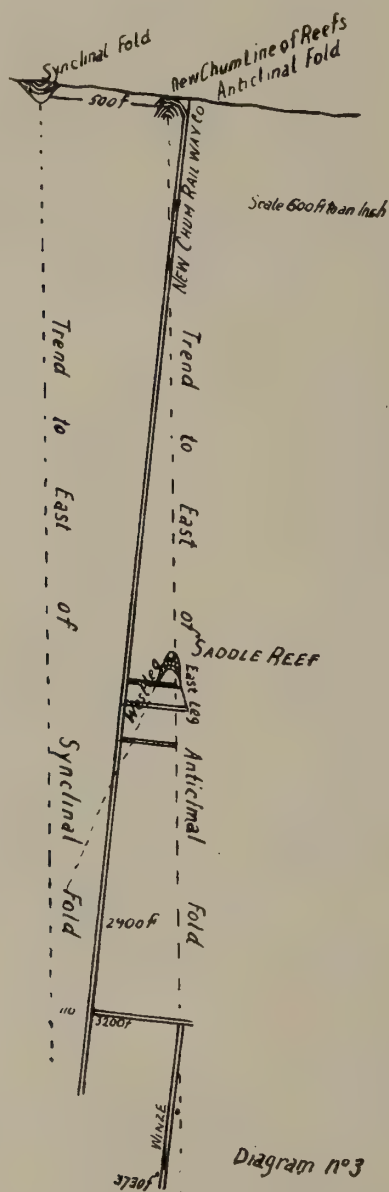
W., but they do not at all times run parallel to each other—in places they nearly converge and again widen out. The distances between the anticlinal folds vary from 400 feet to as much as 1600 feet, and the synclinal folds are not always midway between them. For instance, there is a distance of 660 feet between the Garden Gully and Paddy's Gully lines of reefs, with the synclinal fold only 130 feet west of the Paddy's Gully reef. (Diagram No. 5.)

The fact must be admitted that where the synclinal reefs have been found they are invariably smaller in comparison with the anticlinal reefs, but it must also be noted that very few have been found, and only in a few instances worked to any extent. This smallness may be accounted for as follows:—



When the bending over of the rocks is considered the action would be that the anticlinal folds would leave larger openings or cavities (subsequently filled with quartz), and the tendency would be that any accumulated quartz in the synclinal fold would be smaller, as the rock beds or layers would form so many troughs, one inside the other, the pressure always being downward towards the axes, with an action that would prevent large cavities being formed. There is one at least notable instance where the synclinal reef is a large one, situated 410 feet west of the New Chum line of reef, immediately north of Mr. Lansell's Fortuna battery. This was a well known land mark in the early days, standing some 300 feet above the surface in the form of a pyramid.

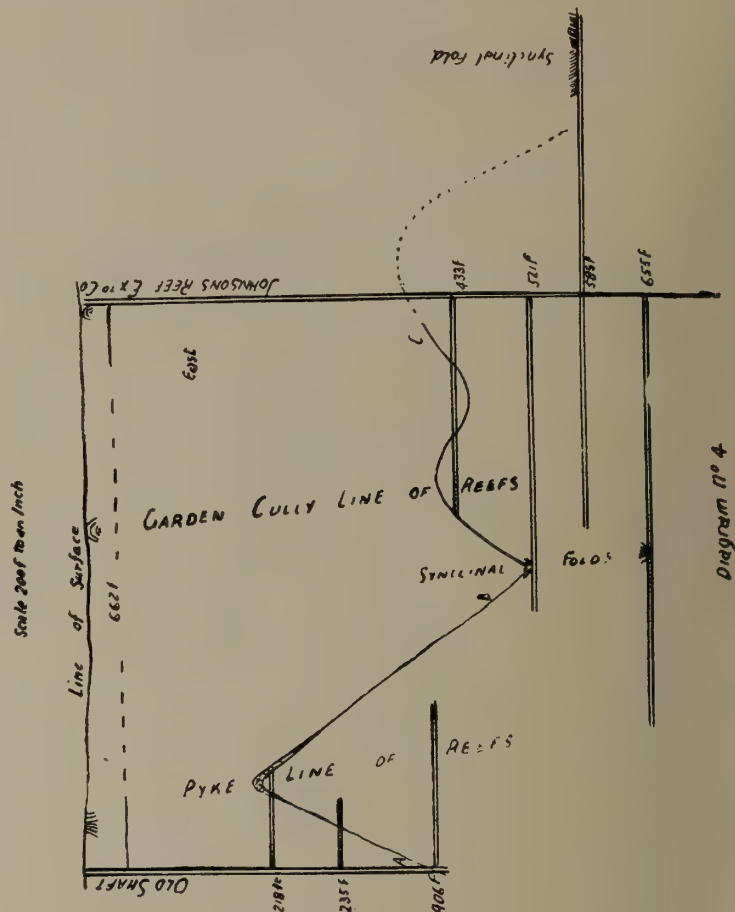
Though the synclinal folds cannot in all cases be fixed accurately on surface, owing to the rocks not being sufficiently exposed, they have been actually found on surface, and at a depth in mines on the following



lines of reefs, viz:—between the Carshalton and Napoleon lines of anticlinal reefs, between New Chum and Nell Gwynne lines, between Deborah and Garden Gully lines, Garden Gully and Paddy's Gully lines, and Paddy's Gully and Derby lines. So far as I know, the greatest amount of work done on a synclinal reef was that on the line between the Garden Gully and Paddy's Gully reefs from Lansell's "Sandhurst" shaft, and also from the east shaft of the Kock's Pioneer Co. This reef was more than payable, and it seems almost unaccountable that more work was not done to further exploit the channel of ground north and south of this locality. Another instance where the synclinal reef was worked is at the Johnson's Reef Extended Co.; here

it was followed for about 200 feet in length, but was hardly of a payable character.

The general local impression is that the inverted saddle reefs are not auriferous, or at least payable so, and that they are small comparatively; but I think this condemnation too sweeping, for it must be remembered that very few have been seen, and very little work done on those that have been found. It may be said also that the synclinal folds have been seen in many places without carrying quartz, and I



agree that it is so; but, on the other hand, we also have numerous instances on the field where cross-cuts have been driven and the anticlinal centre country also found barren of quartz. In such a case, however, a centre country winze is sunk and the reef invariably found, but I know of no case where such work has been done to exploit the synclinal country. I have mentioned where the synclinal reef has been successfully worked, which I think, is sufficient to indicate the importance of searching for them, especially so where the amount of work necessary is small in comparison with that required for prospecting the anticlinal reefs.

From time to time a large amount of information has been gathered to endeavour to trace the same layers of rocks surrounding the auriferous reefs on the one line of reef to other lines of reefs on either side of it. To more clearly convey the importance of this we will assume that at points A (Diagram No. 2) we have a rich reef surrounded by certain rocks. To fix the positions of these rocks at points B, C and D might solve the question that as the reefs at A were auriferous, so are those in the same zone of rocks at B, C and D. Though no definite principle has been evolved so far to decide as to the method of tracing these rocks, still some important move has been made in that direction. To actually decide this question, accurate data and close research are necessary, and with this knowledge at hand some definite scheme may be found to be of practical benefit. In this respect we are not likely to gain much information from the composition of the rocks themselves, as Mr. A. W. Howitt, in his analytical



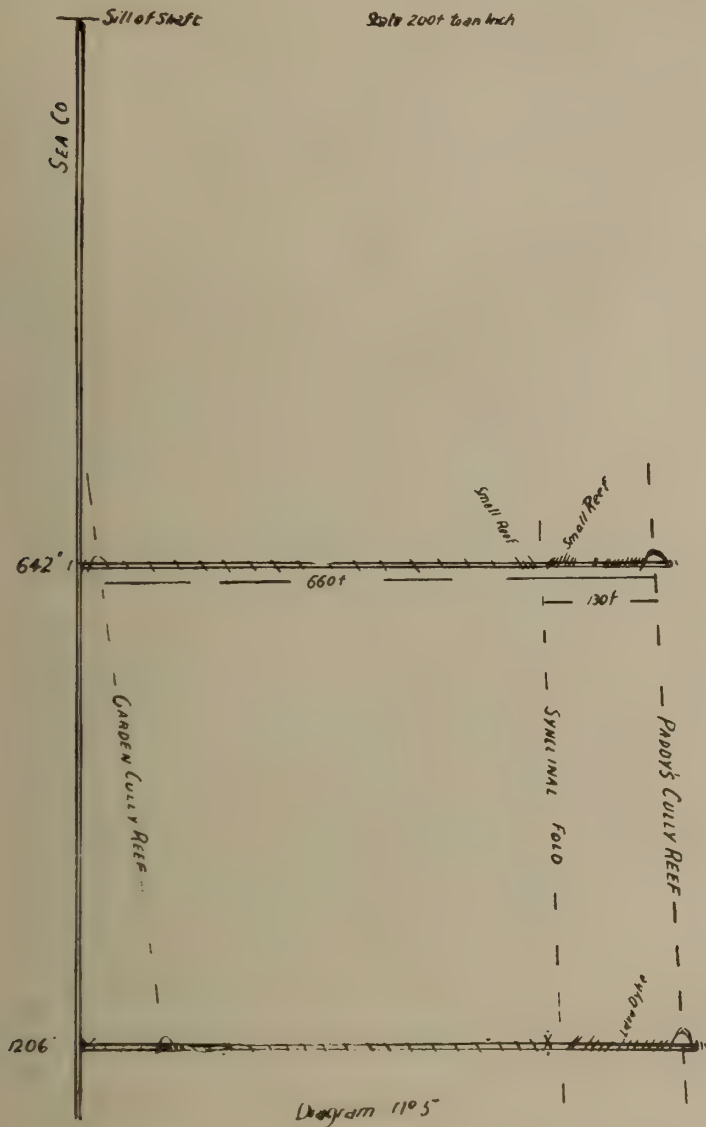
and microscopical examination of the rocks, taken from surface and at frequent intervals to a depth of 3000 feet, from Lansell's 180 Mine, finds that in actual composition there is no difference between them.

In the course of my work on the field, extending over 12 years, I have collected many examples of the synclinal folds under various circumstances, and purpose giving several of them to further illustrate this paper. They are all from actual survey and accurate measurement and will tend to show, in some cases, the practicability of undertaking prospecting work for synclinal reefs at a comparatively

approximately, be found by extending a crosscut at 2,900 feet. Seeing that the reef above 2029 feet was highly payable, it is at least reasonable to assume that the synclinal reef will be auriferous also. It is probable that this highly interesting work will be carried out shortly in this mine, and there are other mines on other lines of reefs where similar work might be done.

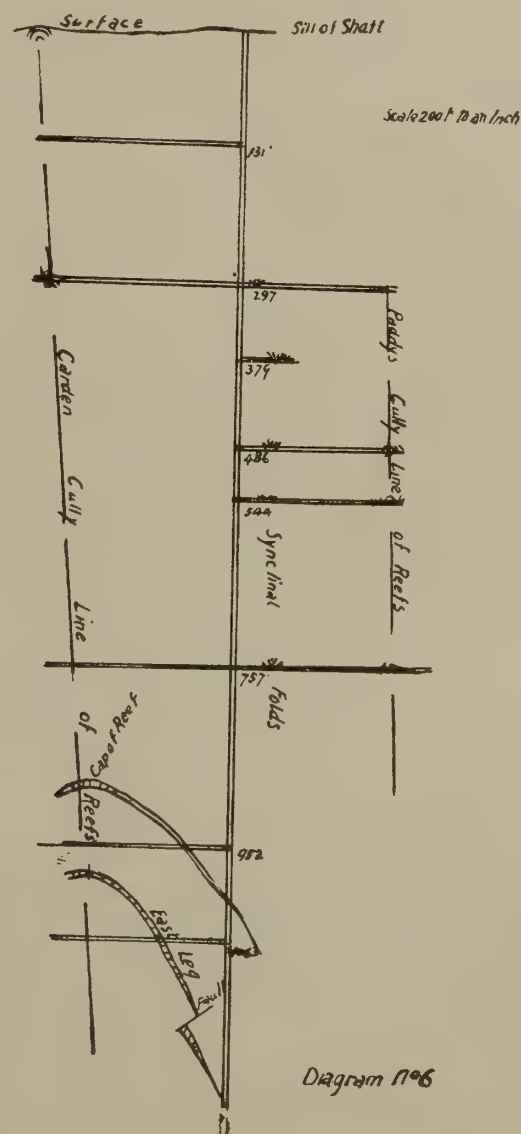
Another interesting and perhaps the most conspicuous example of rock bending and reef formation is that at the Johnson's Reef Extended Mine (Diagram No. 4). In this we have the Pyke and Garden Gully lines of reefs clearly exposed with the synclinal folds on either side of them. The anticlinal reefs were both payable auriferous and the synclinal reef between also carried gold. Commencing at A, the same "back" or "wall" can be followed continuously to points B. and C. An excellent photograph has been secured of this synclinal, which is included in Mr. E. J. Dunn's report on the Bendigo field—Part II.

Still another very good section has been secured at the Sea Co's mine and this shows with what regularity the rocks have been deposited (Diagram No. 5). From this it will be seen that the Paddy's Gully anticlinal is a short fold in comparison with the Garden Gully. By



small cost. By a glance at the diagram (No. 1) it will be seen that successive portions of the anticlinal and synclinal folds are not directly under one another, but have a trend eastward in their downward course of about 10 feet in every 100 feet. Thus as great depths are reached the synclinal folds have been getting nearer to the shafts. The shafts on the Bendigo field have, as a rule, been sunk in close proximity to the anticlinal fold or "centre country." Consequently, though the synclinal folds are some hundreds of feet east and west of the shafts, with the trend eastward, one gets nearer and the other further away as depth is reached. In the case of the New Chum Railway Mine (Diagram No. 3) the synclinal is 500 feet west of shaft at surface, but at, say 3200 feet it will only be about 110 feet west, and when the shaft is sunk still deeper will be intersected by it.

In the same diagram I have shown the position of a saddle reef above the 2029 feet cross-cut. This reef was highly auriferous, and it will be an interesting piece of work to trace downward the west leg of this formation until it reaches the channel of the synclinal, which should,



also comparing this diagram with that of the North Johnson's (No. 6) it will be seen that the Garden Gully and Paddy's Gully lines of reefs have converged, as at the Sea Co., they are 660 feet apart, whilst at the North Johnson's they are only 370 feet apart—a distance of  $1\frac{1}{2}$  miles separating the two mines on the strike of the Garden Gully line of reefs.

Many other examples of the synclinal folds might be given, but



those selected are typical of the field, and sufficient to illustrate the principle advocated.

The main object of this paper is to draw attention to a subject which I think has been somewhat overlooked, and if the foregoing remarks will cause discussion I shall feel that the time occupied in compiling this short paper has been well spent.

### **The Gold Dredging Industry in New Zealand.\***

When the first rush of miners took place on the Molyneux River, in the Dunstan Gorge, the gold was won by means of cradling the gravel, which was shovelled from the various beaches and crevices in the rockbound sides of the river.

The above method of winning the gold was only practicable when the beaches were not covered with water, hence the work was usually carried on during the winter months, the ordinary level of the river during spring and summer months being some ten or twelve feet above winter level. The melting of the snow in the lakes water-shed being responsible for the high summer level of the river.

As the available beaches were worked out, other methods of winning the gold were proposed and worked with more or less successful results; the first advance being to work the bed of the river by means of a spoon dredge. The spoon was made with a round lip or ring of iron, having a steel cutting edge on one half of the circumference, at the opposite side a socket being forged to take a long spar or boom, which was securely fitted thereto. At intervals round the hoop, half-inch holes were bored to enable a bullock-hide bag to be laced on to same. The spoon was worked from a pontoon, which carried a crab winch, tackles, and the necessary washing appliances to treat the washdirt lifted. In starting to dredge, a tackle was attached to near the upper end of the boom, and a line or chain was carried over a cat-head from the crab winch to a point near the lower end of the boom. The spoon, with bag attached, was dropped over the side towards the stern or down-stream end of the pontoon, and dragged up-stream, the boom being kept in a more or less perpendicular position, to cause it to dig into the washdirt. When the workmen judged that there was sufficient gravel in the bag, the upper end of the boom was hauled to a horizontal position. The bag was then lifted on board by means of the crab winch and the contents treated by means of washing. A number of these dredges paid handsomely. Where stony ground was met with, they were, however, of very little use, and owing to the limited quantity of gravel treated per day, only the richest portions of the river bed proved payable.

The next proposal was to sink a pneumatic cylinder, somewhat similar to those used as piers for bridges. There is no doubt that by sinking a cylinder, the crevices in the bottom of the river could be properly cleaned out. However, to reach the bottom a considerable depth of drift and wash in most places had to be passed through, with the result that too much time was lost in reaching bed-rock, and in the nature of things it was not to be expected that the cylinder would go down on a rich patch every time. After a few trials the above scheme was abandoned.

A few enthusiastic spirits then proposed to use a submarine boat, which was actually built and named the "Platypus." This latter got no further than a trial in Otago Harbor. I believe the trial took place about the year 1873. The boat was built conical shape towards the forward end, and nearly square across the stern, about two-thirds of the length being cylindrical with a dome and large manhole in same. At either side there were two paddle boxes open at the bottom, while

underneath there was a rectangular space inside which the men were to work the washdirt. This space communicated with the interior of the boat. In the interior, there were two sets of pumps attached by means of suitable gear to a shaft passing across the boat and through the side of same into the paddle boxes. On the outer ends of the shaft two paddle wheels were fixed, the intention being to operate same by means of the current flowing underneath the paddle box opening. The outer ends of the paddle wheel arms were fitted with sheet iron floats, which were curved to catch the current and at the same time offer as little resistance as possible to the dead water in upper part of paddle box.

In case of accident to the paddle wheels, or in the event of the boat working in slack water, provision was made to disengage the wheels and work the pumps by hand power. Air pipes communicated from the air pumps to the atmosphere above water level. It will be seen from the above description that the proposal was practically an application of the diving bell.

The writer recollects that at the time of the trial of the above boat in Otago Harbour, it was first towed out to be submerged; that part of the performance came off all right. Unfortunately when they wished to make the boat rise sufficiently high to enable the men who were inside to come out, it would not, owing to some mishap to the air pumps, rise high enough to allow the men to come out at the man-hole door. The result was that the boat was towed into shallow water, and when the tide fell the men were able to come out at the man-hole door. Shortly afterwards the boat was sold and cut up into sections, without ever being set to work in the river.

About the same time as the above experiments were being carried out, other proposals were being made to work the river by means of small dredges driven by current wheels fixed on the dredge. A number of the dredges were built for private parties, the machinery, in most cases, being supplied by the late well-known firm of Kincaid, McQueen & Co., Dunedin. The writer was then in the employ of the above-named firm, and recollects the discussion that took place as to whether the dredges were likely to prove payable or not. The buckets of the first of these dredges had only a capacity of one cubic foot, although on the later current wheel dredges, the buckets in some instances had a capacity of two and a-half cubic feet. The water for washing purposes was in most cases lifted by means of rectangular iron cans placed on the arms of one of the current wheels, emptying into a box near the highest part of the wheel.

A number of these dredges paid very well; however, the great trouble was that they could not dredge heavy and deep ground, and in many instances when the runs of gold ran into back waters, or where there was not much current, there was not power to work the dredge.

The more progressive members of the dredging community then began to cast about for some further improvement in the way of dredging. Priestman's steam grabs were advocated by some people, however they did not prove a success. The next proposal was to fit up a steam dredge. After a good deal of thought, Messrs. Kincaid, McQueen & Co. agreed to build a double-ladder steam dredge with iron pontoons, a company being formed for that purpose, the firm also taking a large interest in the venture. The company was known as the Dunedin Gold Dredging Co. During the time the dredge was being built, a small company was formed to put a second-hand engine and boiler on a small dredge; however, the latter venture did not turn out satisfactorily. In due course the Dunedin dredge was built and set to work at Alexandria South, on the Molyneux river. After various delays, incidental to starting a new style of plant, a dividend-paying stage was reached. The buckets had a capacity of about two

\* By WM. WYLIE, in Transactions, Australian Institute of Mining Engineers.



and a-half cubic feet, the engine was an inverted compound condensing engine, the various winches to operate ladder, and moving lines were driven from the main engine by means of suitable gearings and clutches. The sluicing water was lifted by means of a centrifugal pump, the gravel being run through a screen, very much the same as in modern dredges. In designing the above dredge, a mistake was made in putting in two ladders instead of one. The result was that when dredging in rough ground the dredge rolled badly, interfering very much with the work. Wooden pontoons were then built and fixed to both sides of the dredge, outside of the ladders. After a time the dredge was removed down to Millar's Flat, and converted into a single-ladder dredge. After about twenty years' work the company that owns the above dredge is going to be wound up. In passing, I may say that for a long time the above dredge won a great amount of gold, and the shareholders received some handsome dividends.

After a time other steam dredges were built. As more experience was gained, it was found that to give satisfaction the dredges required to be built on heavier lines and with larger buckets. In some of the lately built dredges, the buckets have a capacity of six and a-half cubic feet, with ladders, 74 feet centres, dredging, in some instances, to 42 feet below water level.

Where high banks had to be treated, there was a difficulty in disposing of the spoil. The elevator was then introduced to stack the spoil. As at present designed, the elevators range from 30 up to 130 feet in length, and rise at an angle usually somewhat less than  $45^\circ$  with the horizon. In the small class of elevator, the ladder girder is composed of two wooden beams, while in the larger descriptions it is built up as a light iron girder. On the upper or ascending side of the elevator, there is a series of rollers to carry the bucket chain; while on the lower or descending side either rollers or slides are provided to carry the buckets, there being flanges riveted on sides of the buckets to take the rollers. The buckets of the elevator overlap each other at the edges to prevent gravel passing between them. In the case of a short elevator the bucket chain is usually driven from the top tumbler, by means of a shaft passing up the elevator ladder; while in the case of a long elevator the drive is from the bottom. The tumblers usually have five sides or faces. As a rule the elevator only lifts the gravel, which passes through the revolving screen; the fine material which passes over the tables is deposited at the stern of the dredge.

The average of the dredge buckets on the river have a capacity of from  $4\frac{1}{2}$  to 5 cubic feet, the connecting links being in some instances bar iron, 6 in. x 2 in., with steel bushes in eyes of buckets and links. The usual distance between centres of bucket eyes is two feet; the diameter of the pins to connect buckets and links is from  $1\frac{3}{4}$  to  $2\frac{1}{2}$  in. according to the nature of the wash and the depth to be dredged. The lower tumbler has five faces, while there are only four faces on thread of top tumbler. At the upper end of the ladder two powerful screws are fixed, these screws are used to extend the length of the ladder, and thereby take up a portion of the slack of the bucket chain as the bushes and pins wear. The lower end of the ladder is hung by means of two strong hanger bars. Across the upper end of the hanger bars, a strong crosshead is fixed to which a set of large sheaves is attached, round which the lifting rope passes. Across the forward end of the dredge pontoons, and crossing the bucket well, a gantry is fixed, built either of iron or wood. The top girder of gantry carries the upper set of ladder lifting sheaves. In a number of dredges the weak part is the gantry. However, the style of gantry designed by Mr. L. H. Reynolds, marine and consulting engineer, of Dunedin, prevents the pontoons from canting inwards towards the

bucket well. To enable the ladder to swing up and down, to suit the various depths of dredging, it is hung on a strong shaft at upper end, the bearings of the shaft being securely fixed to forward side of tumbler framing.

The top tumbler is driven by means of a large spur-wheel, keyed on end of tumbler shaft. In some instances, the shaft which carries the pinion which gears into spur-wheel also carries the main driving pulley. For various reasons I do not approve of the above method of driving; the better way is to have an extra shaft to carry the driving pulley, reducing the velocity of rotation by means of gear wheels, which can be more easily done than by means of one shaft. To prevent undue strains when the buckets get foul of large stones, a powerful friction band with friction pulley is provided on one of the shafts. The friction strap is lined with wood and is in two pieces, the ends are connected with spindles, having right and left hand screws passing into corresponding nuts at back of the lugs on either end of straps. These screws can be set to any tension in a few minutes, and are operated by means of a lever operating a sleeve on the shaft, from the sleeve two bars extend to short levers on the screws; by pulling the lever in either direction, the friction can instantly be thrown in or out of gear. It is not advisable to have the friction too tight, otherwise too much strain is thrown on the machinery.

Where two shafts are used, some engineers, to reduce the speed of engine, put the friction gear on the first motion or fast running shaft. This is a mistake, because when working rough ground the friction gear slips a lot and has a tendency to fire, therefore it is advisable to put it on the slower running shaft. In adopting this course the friction gear has to be of a heavier description than would be the case on a faster running shaft.

Both ropes and belts are in use for main drive from engine. Owing to the limited length available between shaft centres, rope drive does not give satisfaction. I prefer a belt drive. Where the work is heavy we have put two belts on the same pulley, first a ten and then an eight inch on top of that.

On the Cromwell Company's dredge, which the writer has just been superintending the erection of, a double belt was put on with very satisfactory results. In the instance cited the ground is very rough, being strewn with large boulders, in places some of the boulders are four and five feet in diameter.

Usually the main gear is driven off one end of engine shaft and the centrifugal pump is driven off the other end of the shaft. The gravel lifted is dropped into a shoot known as a drop shoot which delivers it into a large perforated revolving cylinder or screen. The screens range from 18 to 32 feet in length and from 3 feet 6 inches up to 6 feet in diameter. The perforations consist of some thousands of round holes, the holes being about three-eighths of an inch in diameter at upper end of the screen, and increasing in diameter towards the lower or discharge end. The screens have an inclination or fall in their length, ranging from 18 inches to 2 feet; however, both the diameter of the perforations and the fall of the screen is governed by the nature of the washdirt and the coarseness of the gold to be saved. Water is carried inside the screen by means of a sheet iron pipe, known as a spray pipe, having a large number of perforations in lower side to enable the sluicing water to fall in jets into the wash inside of screen. The above pipe is connected direct to the centrifugal pump discharge. In some instances an angle iron is riveted inside of the screen in the form of an archimedian screw, the idea being to thoroughly wash the gravel. However, in the writer's opinion, the screw is not necessary when treating river wash. The screen is built up with plates ranging from  $\frac{3}{8}$  to  $\frac{1}{2}$  inch in thickness. The screen revolves on four rollers running in suitable bearings. In some instances the screen is driven



by means of a tooth-gearing attached to the screen roller path; however, an improvement has been introduced in the later dredges by driving the screen by means of friction rollers. The screen makes from 15 to 18 revolutions per minute. As mentioned in a previous paragraph, the stones and larger particles of gravel pass out of lower or stern end of the screen, the sand and fine gravel passing through the perforations in screen on to gold-saving tables, built either of wood or iron. The tables are divided into compartments from 36 in. to 42 in. wide and in the direction of flow of water; there are usually two or more brakes or drops across each compartment. The inclination or fall of the tables ranges from one in ten to one in eight, the length in direction of flow of water being from 14 to 17 feet, the width extending nearly the whole length of the screen. The water drops from the tables into a sluice box, which discharges the sand, gravel and water over the stern of the dredge. The tables are first covered with hessian, on top of which is placed cocoanut matting, which is covered with expanded metal; the whole being held in position by means of suitable cleets or clips. In actual practice in the river, it is found that the principal part of the gold is won from the upper half of the table. However, where much fine gold and heavy black sand occur, such as at Oripuki in Southland, and in the black sand leads in Westland on the the west coast of the Middle Island, the writer doubts very much if any modification of the tables as used at present will prove suitable.

The engines used are mainly Marshall's, Robey's and Ruston and Proctor's, all compound surface condensing, the centrifugal pump water being caused to flow through a surface condenser to effect condensation of the steam. All these engines are supplied with governors and expansion valves. The horse power of the engines runs from 12 to 16 nominal. The engines are run up to 150 revolutions a minute. The boilers are internally fired with short combustion chambers and  $2\frac{1}{2}$  in. tubes through to smoke box end. Usually the pressure of the steam carried is 140 lbs. per square inch. The nominal horse power of the boilers range from 16 to 20. Where a 12 horse engine is used, a 16 horse power boiler is employed to provide the extra steam required to operate winches. The fuel used is rather a poor quality of lignite, which is usually found under the surface of the flats comprising the old lake system of Central Otago.

The whole of the ladder, head and side lines are operated by means of powerful steam winches driven by means of a pair of small engines. There are a number of designs of these winches; in many instances the engines for same have been imported, while in other cases they are locally made. One description of winch has a long shaft coupled to engine crank shaft and extending nearly the whole length of the winch; on above shaft there are friction clutches to operate the rope barrels which, with the exception of ladder line, are driven by means of a worm wheel; owing to the ladder line being very much used, open spur gearing is used to drive it. With the exception of the head line and ladder line the other lines are worked in pairs; one friction clutch puts the drum shaft in motion. There is an ordinary claw clutch fixed on the shaft between the barrels, the ends of the barrels also have corresponding claws to fit the clutch. When the clutch is in mid position both drums are out of gear. When moved to right or left, either right or left drum is in gear; powerful brake straps are also provided to hold the drums when the clutches are out of gear. These are powerful winches, and when dredging in a ten knot current plenty of winch power is required. The main drawback to the above class of winch is that they occupy too much space when placed on a small dredge. There is another class of winch made having open spur gearing, this winch does not take up so much as the winch first described and is suitable for the smaller class of dredges.

On the gold bearing flats where water is available, quite a number

of dredges known as dry land dredges are at work. The wear and tear on these dredges are not so great as it is on the river dredges, therefore the ground does not require to be so rich to pay for working. Where much clay is met with in dredging the flats, there is a tendency to discard the revolving screen and use a line of wide sluice boxes in place of the tables; underneath the wide sluice box there is a return box to treat the sand and fine gravel which passes through perforated plates in bottom of main sluice box.

The rule is only to have two men on a shift on the large dredges on the river, that is a winchman and an engine driver.

Nearly the whole of the pontoons are built of wood, different consulting engineers having different styles of construction. So far the stiffest pontoons are those designed by Mr. L. H. Reynolds of Dunedin. They are framed with top and bottom chords and diagonally braced to form a truss. The writer has seen pontoons constructed on the above principle severely tested, and in all instances they have given every satisfaction.

From ten to fifteen ounces of gold per week, according to the size of the dredge and the nature of the ground dredged, will cover expenses.

There is a big future before gold dredging in the middle Island of New Zealand; at the present time there are about 240 dredges in course of construction or ordered. The cost of these dredges will range from £5,000 to £14,000 each.

The following rivers have dredges at work or starting to work on them, viz:—Molyneux, Clutha, Kawarau, Manuarheka, Dart, Shotover, Lindis, Waiau, Mataura, Waipori, Nevis, the above rivers are in Otago and Southland; in the Westland and Nelson on West Coast, on the Totaru, Hokitika, Grey, Ahura, Buller, in Inanghwa and Orwell Creek. In addition to the above a great number of gold bearing flats are being dredged.

To give an idea of the briskness of the iron founding trade, all the foundries from Auckland to the Bluff have for sometime been working full time and in some instances they have been working day and night; even with all this hurry, orders for dredging plant are being sent to Victoria, New South Wales, Europe and United States of America.

From the writer's knowledge of various places in Victoria, and New South Wales, he is satisfied that with modern up-to-date dredges the ground ought to pay handsomely. The great thing is to have a dredge designed to suit the ground it is intended to work. A dredge that is suitable for one class of ground may not give satisfaction in another place.

In many instances claims that would have proved payable, had an up-to-date dredge been put to work, have been condemned owing to an unsuitable plant being used.

### Thefts of Gold Ores, &c.

MR. B. F. WADE, M.P., MOVES IMPORTANT AMENDMENT TO THE CRIMINAL CODE.

The following interesting debate on the subject of thefts of gold, quartz or amalgam, from mines, sluice boxes, etc., took place in the House of Commons, Ottawa, on the 28th ulto. The occasion being the moving of certain amendments to the Criminal Code by Mr. F. B. Wade, M.P., for Annapolis, Nova Scotia.

Mr. WADE—I would like to suggest to the Minister of Justice the desirability of amending section 343 of the Criminal Code. This section now reads as follows:—

Every one is guilty of an indictable offence and liable to two years' imprisonment who steals the ore, of any metal, or any quartz, lapis, claminaris, manganese, or mundic, or any piece of gold, silver, or other metal, or any wad, black cawk, or black lead, or any coal or cannel coal, or any marble, stone or other mineral, from any mine, bed or vein thereof respectively.



2. It is not an offence to take for the purpose of exploration or scientific investigation, any specimen or specimens of any ore or mineral from any piece of ground uninclosed and not occupied or worked as a mine, quarry or digging.

There has been great difficulty in convicting parties under this section.

Parties may be suspected of stealing gold or quartz or amalgam, and in fact may be trafficking in these things, but it is almost impossible to convict them.

I have before me a letter from the secretary of the mining society of Nova Scotia asking that a change be made in this section so as to make it substantially the same as the law of Western Australia. The letter is as follows:—

Mining Society of Nova Scotia,  
Halifax, N.S., 23rd May, 1903.

F. B. Wade, Esq., K.C., M.P.,  
House of Commons,  
Ottawa.

Dear Sir,—I inclose you herewith copy of measures recently passed by the parliament of Western Australia with the view of preventing the stealing of gold ores in that country.

The stealing of gold ores by men working in the mines has become a serious matter in Nova Scotia. It has frequently been brought to the attention of the Mining Society by the managers of mines in different parts of the province, and the Mining Society has frequently urged that legislation similar to that passed in Western Australia should be adopted here. As you are aware, a great deal of gold ore of Nova Scotia is rich, free-milling ore and is peculiarly the kind of ore where loss of this kind is likely to occur. In the Dominion of Canada statutes for 1869, you will find that there was then put upon the statute-book legislation having a similar object to that just passed in Western Australia.

The necessity for legislation similar to that of 1869 is much greater now than it was then. The necessity for such legislation will not be so apparent in other parts of Canada as it is in Nova Scotia, but as it is the Dominion parliament alone that can pass the Act, the Mining Society has, by a unanimous resolution, instructed me to request you to urge upon the proper authorities at Ottawa for such legislation.

In seeking this legislation, the Mining Society has the approval of the Hon. Mr. Drysdale, Commissioner of Works and Mines for this province.

Yours very truly,

H. Y. WYLDE,  
Sec.-Treas.

I have also a letter from the commissioner of mines of the province, in which he says:—

Halifax, May 28th, 1903.

Dear Sir,—The secretary of the Nova Scotia Mining Society has handed me a copy of a letter sent you under the date of May 23rd, and also copy of legislation which is recommended by the Mining Society, and which I understand it is desired that you should promote, or ask the Minister of Justice to undertake the promotion thereof. The matter dealt with in this proposed legislation is of serious moment to the gold mining industry of Nova Scotia.

I am entirely in sympathy with the proposed Act, and anything I can do in the way of explanation or assistance will be cheerfully done. I simply write to you to say that this matter has been brought to my notice on several occasions by the society, and that this department of the government would like to see such legislation placed upon the Dominion statute-book.

The amendment I am asking for is designed to apply only to Nova Scotia, I do not think it would be possible to make it apply to the whole Dominion. In Nova Scotia the circumstances are such that it is the easiest thing in the world for a man to steal large quantities of gold or amalgam and not be detected. The principle I am seeking to introduce into our law is this, that when a party is found with gold or amalgam in his possession the burden will be upon him to show that he came by it honestly. I will read the proposed amendments:—

By inserting immediately after section 343, the following sections:

343a. The provisions of section 343b, 343c, 343d and 343e, apply only to the province of Nova Scotia.

343b. Every one is guilty of an offence and liable on summary conviction to a fine not exceeding \_\_\_\_\_ or to \_\_\_\_\_ months' imprisonment, who has in his possession any gold (as hereinbefore defined) which to his knowledge has been stolen or otherwise unlawfully obtained by himself or others and the burden shall lie upon any person charged with an offence under this section and shown to have had gold in his possession of proving that such gold was not so stolen or unlawfully obtained, or, if it was, that he was ignorant of the fact.

343c. Every one is guilty of an offence and liable on summary conviction to a fine not exceeding \_\_\_\_\_ and to \_\_\_\_\_ months' imprisonment, who assists in the commission of an offence under section 343d, and for the purpose of this section any person shall be deemed to have so assisted who is proved

(a) to have been watching and patrolling outside and in the vicinity of any premises on or about which gold, reasonably suspected of being stolen or unlawfully obtained or held, is found and seized by any peace officer, or by any person acting under warrant of a justice, or

(b) to have been accompanying any person having in his possession any gold reasonably suspected of being stolen or unlawfully obtained or held and who is unable to give or does not give an account of himself satisfactory to the justice who hears the case.

343d. Every one is guilty of an offence and liable on summary conviction to a fine not exceeding \_\_\_\_\_ or to \_\_\_\_\_ months' imprisonment, with or without hard labour, who being found present at the time when any gold reasonably suspected of being stolen or unlawfully obtained or held is

found and seized by any peace officer or by any person acting under warrant of a justice, and who is unable to give or who does not give a satisfactory account of his presence. Provided that no person shall be convicted of an offence under this section if he proves to the satisfaction of the justice that his presence was innocent.

2. A person may be convicted under this section notwithstanding that no other charge is laid or conviction obtained against any person in respect of such gold.

343e. Upon conviction under any of the three next preceding subsections, the justice may order the gold in question to be delivered to the person whose right to the same shall be found by him, and failing any such person, the gold shall be forfeited to the Crown.

343f. In the four next preceding sections and in sections 313, 343, 375, 571 and 707 the expression "gold" or "piece of gold," unless the context otherwise requires, means gold bullion, retorted gold, gold ores, gold amalgam, gold alloys, precipitates containing gold, slag, concentrates, tailings and residues.

I may also read the amendment which I propose to make to section 707. That section refers to stealing gold by employees. My amendment is to repeal section 707, and to enact in its place the following:

707. In any prosecution, proceeding or trial for stealing ores or minerals, or for taking, obtaining removing or concealing ores or minerals for a fraudulent purpose, the possession of any smelted gold or silver, or any unsmelted or otherwise unmanufactured gold or silver, by any operator, workman or labourer actively engaged in or on any mine, shall be prima facie evidence that the same has been stolen by him.

These amendments are drawn strictly along the lines of the Western Australian Act, making such alterations as are necessary to adapt them to the workings of our own Criminal Code. The matter is one of great importance to the gold miners of Nova Scotia, as well as for the government of the province. It is believed that at the present time the province is losing a substantial amount of the royalty it is entitled to on gold which is extracted, by the operations of the parties who are trafficking in stolen gold, stolen amalgam and stolen ore. This has gone to such an extent that in one case with which I am acquainted a mine owner lost \$1,600 to \$1,700. The traffickers in stolen gold would set up a shanty where they would sell whiskey to the miners in camp, and in payment they would take nuggets and amalgam which they would in turn sell to dealers, or run it down themselves. This has been going on to such an extent that there is a unanimous demand on the part of the mining industry, seconded by the provincial government, to have the Act amended in the form in which I now propose. There will be no hardship on the honest miner. Hon. gentlemen can understand how difficult it is to convict. You might be certain that a party has stolen your gold, and you might have him arrested and find the gold in his possession, and yet it may be impossible to prove that it is your gold, or to prove that it was stolen. On the other hand there is no hardship for the man who has come honestly by the gold in his possession, to tell how he got it. This is the sum and substance of the amendment I propose.

Mr. FRASER—There is more reason in this case that the onus should be put upon the party having the gold or amalgam in his possession, than there is in the case of violators, for example, of the fishing or of the game laws, where a man must show how he came by the fish in his possession or how he came by the wild animal in his possession. He must show where he got it. These amendments are very necessary in Nova Scotia, because up to this date mining in Nova Scotia has been the only means of reaching quartz. Until within a few years people never thought of mining for quartz at all, unless they saw a rich specimen of gold in it. You get a piece of quartz and you may see in it specimens of great value. It is easy for the workman, if he is evilly inclined, to take a piece of quartz that is quite valuable. At present you have to prove where he got it, and it is impossible to do so. This is particularly true in the case of amalgam. There is a clear case where he should show where he got the amalgam, because that is not sold. The man that mines wants his own amalgam, he would not part with it at all because he uses it himself. That is the way he pays for working the mine. Again, there can be no question that the man who has a piece of amalgam in his possession ought to show where he got it, and so also with a piece of quartz. This provision will do no person any harm, because if a man has a piece of gold or a piece of quartz he can easily show where he got it. If it was found in a new place he could show that the gold was not stolen from the mine. There is no hardship in making a man say where he got a valuable piece of property like quartz, or gold, or amalgam. I know there is a good deal of gold mining in the country from which I come and though there are not a very large number of thefts committed, I have known of cases in which a good deal of gold has been taken. I think the amendment is in the interest of gold mining, particularly in the province of Nova Scotia. It can do no harm to an innocent man. There is not very much danger of an innocent man being taken up because an innocent man can easily show how he came by the gold or amalgam that he may have in his possession.



Mr. BORDEN (Halifax)—The first clause, 343b, seems to be very comprehensive. I have no doubt that there is an evil for which some remedy may perhaps be sought, but I would not have supposed that it would have been necessary to make section 343b so extremely comprehensive, because it would be applicable to any person going along the street with a five dollar gold piece in his pocket. He could be arrested at once and it would be necessary for him to prove that he had not stolen it. I cannot make anything else out of the section:

Every one is guilty of an offence and liable on summary conviction to a fine not exceeding \_\_\_\_\_ or to \_\_\_\_\_ months' imprisonment, who has in his possession any gold (as hereinafter defined) which to his knowledge has been stolen or otherwise unlawfully obtained by himself or others and the burden shall lie upon any person charged with an offence under this section.

Under that if you find any man with a piece of gold in his pocket you immediately make it necessary for him to prove his innocence. I think the West Australian statute must contain some particular clause applying to a man working in a mining district or to a person of that kind.

Mr. WADE—The West Australian statute is quite as comprehensive and I think in exactly the same words as this. This subsection 343b deals with the stealing of ores, quartz, &c. It only has reference to that. I do not think the danger which the hon. leader of the opposition (Mr. Borden, Halifax) points out could arise because it only provides that the penalties shall be applicable if a man has gold in his pocket knowing it to be stolen. If he has a sovereign in his pocket knowing that to be stolen, he should be pulled up and made to account for it.

Mr. BORDEN (Halifax)—I was referring to the fact that if he had gold in his pocket it was prima facie evidence that he had stolen it.

Mr. WADE—I think the hon. gentleman is facetious in that.

Mr. BORDEN (Halifax)—Not at all.

Mr. WADE—What is asked by the mining fraternity is that the burden of proof of showing that he came by his gold honestly is cast upon the party who has it. My hon. friend, I assume, is aware of the evil that does exist and the complaints that have arisen. There are two classes of men that are complained of; one is the man who goes and shuts up the shanty that I have spoken of, and the others are the pedlars or perambulating dealers who go around the mining camps amongst the employees or other parties roaming around. I have a request from the mining interests in Nova Scotia that this principle should be conceded and I see no reason why it should not be.

Mr. FRASER—I do not think that gold would be taken to mean gold coin. I think the section taken as a whole makes it clear what we are legislating against and we are not legislating against the possession of gold coin. But, if there is any difficulty, I think the use of the words "gold coin" would cover it.

Mr. WADE—There is no necessity under my interpretation clause. Section 343f provides:

In the four preceding sections and in sections 312, 343, 375, 571 and 707 the expression "gold" or "piece of gold" unless the context otherwise requires, means gold bullion, retorted gold, gold ores, gold amalgam, gold alloys, precipitates, containing gold, slag concentrate, tailings and residues.

So it does not touch the sovereign in the pocket of a man. Nevertheless I would like to point out to my hon. friend (Mr. Wade) that if he should go back to Nova Scotia with a piece of ore in his pocket he might be arrested as soon as he entered the county of Cumberland and put on his trial and be prima facie guilty.

Mr. WADE—I will take my chances on that.

Mr. MONK—Unless the conditions in Nova Scotia are special to that province we should hesitate to enact this legislation which is so contrary to the principle of our Criminal Code, because under this amendment the moment the party is charged he is obliged to prove his innocence.

Mr. WADE—He only has to prove where he came by the gold.

Mr. MONK—That is proving his innocence. If there are peculiar circumstances in Nova Scotia it may be that my hon. friend is right; but we have gold mines in the province of Quebec.

Mr. WADE—It does not apply to Quebec.

Mr. MONK—They may not be as valuable as the mines in Nova Scotia, but if this is useful legislation it should apply generally throughout Canada. It is an innovation and it makes our law analogous to the criminal law of France, which is so very objectionable and under which the party charged is obliged to exculpate himself. We should hesitate before we introduce that principle into our law.

Mr. WADE—It is not unique, because we have the same principle applied in the Customs Act.

Mr. MONK—That is not criminal law.

Mr. WADE—It is a penal statute which imposes heavy penalties, the forfeiture of goods, and imprisonment. An officer of the Customs Department may walk into the store of any merchant and demand his invoices, and if he cannot produce them he is summarily fined and his goods forfeited. This is to meet a case where it is an impossibility to convict. In my experience in my profession, which extends over 25 years or more, I have never known but one party to be convicted of stealing amalgam or gold, and yet it is a known fact that from every mining camp there are thousands and thousands of dollars worth of gold stolen every year. I know what the conditions in Nova Scotia are, and that is the reason why I ask that it apply to Nova Scotia. The government there is directly interested, and if any other province wishes to have these provisions extended to it, I certainly have no objection.

Mr. MONK—The customs laws do not constitute part of our Criminal Code. In the province of Quebec we have a great deal of provincial legislation under which the burden of proof is thrown on the party charged, but this is introducing in the body of our criminal law a principle which is new.

Mr. FRASER—The same principle applies in our game laws. If a person is found with a salmon or a moose taken out of season he has to prove where he got it.

Mr. MONK—That person would be charged with an infraction of the game laws under a provincial statute and not with a criminal offence.

Mr. FRASER—If he does not pay the fine he goes to jail, so that the effect is exactly the same. The taking of the property of others which has been paid for is worse than having a salmon in your possession out of season.

The MINISTER OF JUSTICE—The principle laid down in this amendment is already to some extent in our Criminal Code in respect to taking branded cattle, marked timber or public stores; but the person who has these in his possession has an opportunity of knowing where they came from, because they were branded. This legislation goes further than that, and it appears to be very drastic, because the person who takes the gold has no means at first sight of ascertaining where it came from. I would suggest that we allow this amendment to stand over for consideration, so that I may have an opportunity of looking into one of the Natal Acts, which I believe contains a provision with respect to those who work in the diamond mines. I apprehend that this legislation would be similar to that, and I would like to find out how it operates.

Mr. WADE—I have no objection to that.

### Bounties on Canadian Lead.

In the House of Commons on the 6th inst., Hon. Mr. Fielding, Minister of Finance, moved the resolution granting a bounty of \$15.00 per ton on lead contained in lead bearing ores mined and smelted in Canada.\*

Speaking on the resolution Mr. Fielding said:—

This resolution provides for the repeal of the existing Act passed in 1901 respecting bounties on lead and provides another system of bounties in lieu thereof. The bounties provided by the existing Act are for the refining of lead. A refinery has been established under that Act but it has done very little. At all events we have had occasion to pay but a very small amount so far. I am advised however that the proprietors of the refinery are consenting parties to this legislation, so that although in the form of resolution we are now proposing, no reference is made to refining, the refining process is by no means given up but will still be continued. We propose to provide a bounty equivalent to \$15 a ton on the lead contents of lead bearing ores, when sent to smelters in Canada. I propose to make a slight change in the wording of the resolution but not in its essence. The plan is that the bounty shall be paid on evidence that the lead has been smelted in Canada. It has been pointed out, however, that the lead ores are delivered to the smelter and may not be smelted for a considerable time. We propose that samples shall be taken and assayed and payments made to the miners on these assays. We propose to adapt ourselves to the practice of the mines, and by a slight amendment it is intended that sixty per cent. of the bounty may be paid to the producer who has delivered his lead to a smelter for the purpose of being smelted in Canada. Forty per cent. of the bounty will be retained until it is proved that the actual smelting has taken place. That forty per cent. shall not in any case be paid before the end of the fiscal year for this reason. We provide that that lump sum shall not exceed \$500,000 in any one year. If the output proved larger than the \$500,000 would pay for, then the rate per ton

\*For full text of this resolution see Canadian Mining Review, July, 1903.



shall be reduced accordingly, so that the amount paid shall not exceed \$500,000 in any one year. It has been suggested by those interested in the lead industry that it is possible—and this is not necessarily a reflection on the owners of smelters—that circumstances might arise in which the owners of smelters and transportation line might take such action as would prevent the smelting in Canada at fair and reasonable rates. While that is not likely, it is a possibility which might as well be guarded against, and provision is made that if any such circumstance should arise and the Governor General in Council be satisfied that there is no interference with smelting conditions in Canada, then the lead ore may be exported and the government may make a reduced rate of bounty adapted to that condition. Another condition of some importance is that with regard to the value of lead. Lead has ranged in price from as high as £17 in the last few years to as low as £12 11s. and sometimes lower still. From the best information we have received, there is a standard price of lead in the London market. Whenever it goes above £12 10s. it would be proper for us to reduce the bounty. If it does not rise above that price, this bounty shall stand. If it should advance, as in former years, the lead miners would be receiving such a good price for their lead that this bounty would not be required. We have taken £12 10s. as the standard price of a ton of lead, according to the English method of weight 2,240 pounds. I think the latest quotations are about £12 5s. If the lead advances in price, as it has done in former years, above £12 10s., there shall be a corresponding reduction in the amount of bounty.

Mr. BORDEN (Halifax)—The hon. gentleman speaks of the bounty entirely ceasing when lead has attained a certain price. What price would that be?

Mr. FIELDING—At about £16 10s.—the bounty would cease entirely. I am advised that lead has been as high as that in the last four years and indeed higher. The bounty shall be given for a period ending in 1908. Another clause I propose to insert, which is not in the resolution, is intended to meet a new process which has been brought to our notice. We propose to pay this bounty on lead which is smelted in Canada—a part of it on delivery of the lead ore at the mill and the balance on evidence that the smelting process is completed. It has been represented, however, that there are new processes for the manufacturing of lead which do away with the smelting processes, and that certain products of lead may be made direct from the ore without passing through what is commonly known as the smelting process. It is not likely that that system will be extensively developed, but it is scientifically established that it is feasible, and I propose to insert a clause providing that if at any time it shall appear to the satisfaction of the Governor General in Council that products of lead are manufactured in Canada direct from ores mined in Canada, without the intervention of the smelting process, the Governor General in Council may make such provision as may be deemed necessary to extend the benefits of this Act to the producers of such ores.

I think Sir, that covers all the points mentioned in the resolution. The lead industry, a few years ago, was a very extensive one in British Columbia, the output having been as high, in 1900, as 30,000 tons. I believe the present is about 3,000 tons. However, since these resolutions were placed upon the Notice Paper, there has been quite a revival of the lead industry, and we have every reason to believe that, under the influence of the aid to be given, there will be a large development of this industry in British Columbia.

Mr. CLARKE—When will the payment of this bonus be commenced?

Mr. FIELDING—It will take some time, I suppose, for the mines to get into operation, but if they were in operation at once after the passing of this Act, payments would be begun.

Mr. CLARKE—The bounty will not be paid on any ore that has already been mined?

Mr. FIELDING—My attention has been drawn to that point. From the best information I could gather, the quantity of ore already mined is very small. It would be difficult to distinguish between the ore on the dump and that which is to come out. Still, if it were likely to be a matter involving a considerable sum, we should take steps to make the distinction. But we are advised and believe that it will hardly be worth while to do so.

Mr. CLARKE—The bounty will be paid on the lead ore already mined?

Mr. FIELDING—Yes, that now on the dump.

Mr. ROBINSON (Elgin)—What guarantee will the minister have in paying the bonus? How will he know what quantity has been mined?

Mr. FIELDING—In all bounty legislation we must give, as we do in this case, power to the Governor in Council to make regulations. The Department of Trade and Commerce, under whose direction this matter will come, will have to provide regulations so as to take the greatest precautions against fraud. \* \* \* \* \*

Hon. Mr. BORDEN (Halifax), Leader of the Opposition, said in part:—  
“This is undoubtedly a very important industry in the province of British Columbia, and the hon. gentleman (Mr. Fielding) is not giving the House very much information as to the causes in relation to that industry which have induced the government to adopt this measure of encouragement. I understand that the amount of capital invested in silver lead mines in British Columbia is supposed to be about \$20,000,000. No doubt, the hon. member for Yale and Cariboo (Mr. Galliher) would be able to inform the House as to that. The amount invested in railway and steamship lines which depend largely upon this industry, I understand, is in the vicinity of \$12,000,000 or \$15,000,000. The amount invested in smelters is \$800,000. The lead production in 1900 was 31,670 tons, worth \$4,487,000; in 1901, the production was 25,700 tons, worth \$3,336,600; in 1902, the production was 12,000 tons, valued at \$1,154,000, but the production has fallen at the present time, as the hon. Finance Minister has stated, to about 3,000 tons. What I would like to know from the Minister of Finance is what effect he expects this bounty will have on the maintenance and development of lead-ore production. Is it expected that this will give the Canadian market to the Canadian producer of lead to any greater extent than at the present time? I understand that our consumption of lead in Canada is somewhere in the vicinity of 14,000 tons annually. I do not know whether that is correct, or whether the Minister of Finance has different information.

Mr. FIELDING—That is about correct as I am advised.

Mr. BORDEN—And all that we consume is imported, I understand, with the exception of about 3,000 or 4,000 tons. Is that in accordance with my hon. friend?

Mr. FIELDING—Yes.

Mr. BORDEN—Then, is the bounty expected to have the result of giving the Canadian market to the Canadian producers to any greater extent than at present? In the next place, will the bounty have the effect, that we all desire, of establishing in this country any of the industries allied to the production of lead—for example, works for the corrosion—I think that is the expression—of lead and other industries, which, I believe, might be expected to result from the encouragement of this industry by a protective duty? I do not know whether the Minister of Finance has any information for the House on these subjects; but it seems to me that it would be extremely desirable that some policy of encouragement to the lead-mining industry should be adopted which would bring about results of this kind. If this bounty will not give to the lead-producers of British Columbia the control of the home market to any greater extent than they have control at the present time, it will amount, in a great measure, to a bounty on export. If the lead producers have to send to a foreign market to sell all the lead they produce in excess of 3,000 or 4,000 tons sold in Canada, practically we are paying a bounty to encourage production first, but, in the second place, to encourage the export of what we produce.

Now, I am desirous of supporting the government in any measure which will have the effect of developing this industry in British Columbia and of increasing the production of our own lead mines in Canada, but I would rather see that accomplished in a way which would give the lead producers of this country control of their own market. I dare say, that if it were attempted by means of a revision of the customs duties, it would be necessary to make changes in the customs duties for the purpose of increasing the protection to other industries, but would it not be desirable to do that if by doing so you could not only give the Canadian producers of lead control of the Canadian market, but at the same time give encouragement to the establishment in this country of the other industries to which I have referred? I have no doubt that all these matters have been under the consideration of the hon. Minister of Finance, but I think it would be well that he should give some information to the committee on this point, because I think he will agree with the rest of us, that if it is possible to accomplish the results which I have indicated, it is desirable to do so. I have a good deal of doubt, myself, as to whether the system of bounties which is proposed by these resolutions would accomplish the result in anything like the way it could be accomplished by increased protection in the shape of customs duties. At the same time, I realize to so very great an extent the importance of this industry, not only to British Columbia, but to the country as a whole, that I am willing to support the government even in this measure which the hon. Minister of Finance has introduced, although I am of the opinion, which I think is very well founded, that a better result might have been accomplished in the way I have indicated. I would like if the hon. Minister of Finance would give us an idea as to the causes of the depression in the lead industry.



Mr. FIELDING—It is very largely due to the attitude of the American trusts and combinations, which have practically shut our lead out of the market; but as to the general question as to the effect of this bounty upon the home market, I think my hon. friend will agree with me that the home market is entirely a question of price. If the producer of lead in British Columbia can sell his lead low enough, he will have control of the home market. This bounty will enable him to sell his lead at a lower rate than he could otherwise sell it for, and in that way he can get access to the market. I do not think the lead producers contemplate dealing in this way with the export trade. They will have to export some, because the total consumption is only 14,000 or 15,000 tons, and they contemplate an output of at least double that, and some portion will have to be exported; but I anticipate they will supply a much larger amount to the home market than has been done in former years. However, I imagine that with the bounty and with lead being produced under more favorable conditions, it will enable other manufacturers to take this lead and to develop their industries, although it is only a conjecture as to that. I understand, however, that there are parties who propose proceeding in the production of white lead, which is a product of the corrosion process, and it is very likely that that product will be made in Canada under the assistance given in this way."

\* \* \* \* \*

A long discussion followed as to the respective merits of bounties and straight protection, participated in by Messrs. Sproule, Galliher, Pope, Macpherson and others, after which, with reference to a new chemical process for the extraction of lead by electricity which may be established by Canadian capitalists at Niagara Falls, Hon. Mr. Fielding moved to insert the following:—

If at any time it shall appear to the satisfaction of the Governor in Council that products of lead are manufactured in Canada direct from lead ores mined in Canada without the intervention of the smelting process the Governor in Council may make such provisions as may be deemed equitable to extend the benefits of this Act to the producers of such ores.

Mr. BLAIN—Does the government expect that such a process will be soon adopted?

Mr. FIELDING—I had an application since this resolution was placed upon the paper from some gentlemen in Toronto, who stated they were engaged in an industry by which they proposed to produce the products of lead without the smelting process. I asked for information, and they gave me the opinion of experts that it was reliable and would probably be put in operation. I thought it right to make the resolution wide enough to cover that operation as well as the smelting, if it should turn out satisfactory.

The motion was then agreed to and Bill read the first time.

### Iron and Steel Bounties.

The following resolution was moved by Hon. Mr. Fielding in the House of Commons on Aug., 4th:—

That it is expedient to enact as follows:—

1. The Governor in Council may authorize payment of the following bounties on the undermentioned articles manufactured in Canada from steel produced in Canada from ingredients of which not less than fifty per cent of the weight thereof consists of pig-iron made in Canada, viz.:

(a) On rolled, round wire rods not over three-eighths of an inch in diameter, when sold to wire manufacturers for use in making wire in their own factories in Canada, a bounty of six dollars per ton;

(b) On rolled angles, tees, channels, beams, joists, girders, or bridge, building or structural rolled sections, and on other rolled shapes not round, oval, square or flat, weighing not less than thirty-five pounds per lineal yard, and also on flat eye bar blanks, when sold for consumption in Canada, a bounty of three dollars per ton;

(c.) On rolled plates not less than thirty inches in width and not less than one-quarter of an inch in thickness, when sold for consumption in Canada for manufacturing purposes for which such plates are usually required and not to include plates sheared into plates of less width, a bounty of three dollars per ton.

2. The Governor in Council may make regulations to carry out the intentions of the foregoing section.

3. That chapter 8 of the statutes of 1899 be so amended as to provide that the bounties on steel and iron authorized by chapter 6 of the statutes of 1897 shall be continued until the thirtieth day of June, one thousand nine hundred and seven, and that the rates of such bounties shall be as follows:

(a.) From the first day of July, one thousand nine hundred and three, to the thirtieth day of June, one thousand nine hundred and four, both inclusive, the bounties shall be ninety per centum of the amount fixed by the said chapter 6 of the statutes of 1897;

(b.) From the first day of July, one thousand nine hundred and four, to the thirtieth day of June, one thousand nine hundred and five, both inclusive, the bounties shall be seventy-five per centum of the amount fixed by the said chapter;

(c.) From the first day of July, one thousand nine hundred and five, to the thirtieth day of June, one thousand nine hundred and six, both inclusive,

the bounties shall be fifty-five per centum of the amount fixed by the said chapter;

(d.) From the first day of July, one thousand nine hundred and six, to the thirtieth day of June, one thousand nine hundred and seven, both inclusive, the bounties shall be thirty-five per centum of the amount fixed by the said chapter.

The MINISTER OF FINANCE (Hon. W. S. Fielding)—The House has had before it from time to time during the present session the question of granting some aid to the iron and steel industry. The government have come to the conclusion to propose certain legislation as set forth in the resolution now before the committee. The reasons which have led the government to prefer to grant aid in this shape rather than by making material changes in the customs tariff have been explained in previous discussions on the question of bounties. The resolutions now before the committee deal with the bounty question in two forms. First, we have certain resolutions dealing with the bounties which are already on the statute-book, and then we have a further resolution by which we propose to grant bounties for new forms of the steel industry which are not at present in operation in Canada. Dealing first with the question of the bounty as provided by existing legislation, I may remind the House that in the year 1897, the bounties were fixed at \$3 per ton on steel, \$3 per ton on pig-iron made from native ore, and \$2 per ton on pig-iron made from imported ore. By subsequent legislation, a sliding scale of bounties was provided whereby the bounties fixed in 1897 should begin to diminish. That sliding scale took effect last year, and last year the bounties were payable on the basis of 90 per cent of the bounties as established by the Act of 1897. Provision was made that these bounties should be further decreased in the following year to 75 per cent, then to 55 per cent, then to 35 per cent. What is proposed in the present legislation touching bounties on pig-iron and steel is that we shall suspend for a year the operation of the sliding scale, so that, for the present year, instead of paying on the basis of 75 per cent of the bounties as at first established, we shall continue to pay for this year 90 per cent of the bounties fixed in 1897, the same as last year. The manufacturers will thus receive for two years 90 per cent, instead of one year 90 per cent and the other 75 per cent. As a means of forming some estimate of the probable difference this will make to the steel industry in the current year—

Mr. BENNETT—May I ask the Hon. Finance Minister if it makes any difference whether it is manufactured entirely from Canadian ore?

The MINISTER OF FINANCE—The bounties established in 1897, as I have said, were at certain fixed rates, one on native and one on imported ore; but the reduction was on the basis of a percentage which applied to all. From a statement made a short time ago as to the amount paid in bounties in the past year, it appears that that amount was \$1,098,359. This was on the basis of 90 per cent of the bounty fixed in 1897. Some accounts will probably come in later which will increase that sum, but we are speaking now entirely of the approximate estimate which I had the privilege of presenting to the House some days ago.

Mr. WILSON—That is not the statement that appears in 'Hansard' in answer to the question asked.

The MINISTER OF FINANCE—Yes, but my hon. friend (Mr. Wilson) will find that the figures given in 'Hansard' included some balance from the previous year. Am I not correct?

Mr. WILSON—Yes.

The MINISTER OF FINANCE—I am dealing with the estimate of last year with a view to getting an approximate estimate of what the difference is to be. As shown in 'Hansard' the payments are somewhat larger than I have given, and they include some bounties earned in the previous year. And it is only fair to say that there will be some later payments to add to the figures I have given for the past year. All I can give now is an approximate statement. On the assumption that the sliding scale would remain without change and that the output would be the same, we should pay to the companies for the coming year, on the basis of 75 per cent, \$915,299. But, instead of paying them on the basis of 90 per cent; and, assuming that the output is substantially the same, they will receive for the present year the same as they received for last year. If the output should increase, the amount they will receive will increase proportionately. On the basis of the figures I have given, the difference would amount to \$183,059, that being the difference between paying on the basis of 90 per cent, as paid last year, and 75 per cent, as would have been paid this year had we made no change in the regulation. We do not by this resolution increase the period of bounties, but we change the percentage in the way I have described. So much then with reference to the difference it will make for the present year.

Mr. CLANCY—Does the hon. gentleman not increase it one year by



reason of repeating the 90 per cent, and then continuing the balance of the year on the sliding scale, as was formerly provided under the Statute? Is there not an increase of one year by that.

The MINISTER OF FINANCE—No, not of time, there is an increase in the amount payable, because in the original arrangement the five years was with respect to the payment on the basis of 25 per cent; as it stands now, by the suspension of the operation of the sliding scale for one year, in the final year they will receive a payment on 35 per cent. For the present year and for each of the succeeding years, payments will be made at a higher percentage than was contemplated by existing legislation, and giving the whole difference it will make for the current year, it will make for each of the succeeding years a difference to the extent of the variation of the percentage in each case. By moving the sliding scale forward you pay them at a higher percentage than you would pay them by adhering to the present sliding scale.

Hon. Mr. HAGGART—For the subsequent years then there will be an increase of the bounty to what was proposed under the Statute.

The MINISTER OF FINANCE—There will be in the percentage. But while the starting period remains the same, we will this year pay them 90 per cent of the total instead of 75 per cent, as now proposed, we will next year pay them 75 per cent of the total instead of 55 per cent; in the following year we will pay 55 per cent instead of 35 per cent; and in the final year we will pay them 35 per cent instead of 25 per cent. The effect therefore is that you move forward the sliding scale one year, but you give them, during this year, a higher rate of percentage than you would otherwise, but terminating with 35 per cent instead of 25 per cent, as proposed in the existing legislation.

Then, Sir, beyond that we have made some proposals with respect to articles which are now manufactured in Canada. It was thought desirable that, if we were to grant further aid to the iron and steel industry, we should not only have regard to the manufactures which are now in progress, but we should endeavour to secure some advance in the manufacturing industry by the production of lines of goods not at present produced in Canada. We have therefore proposed to grant additional bounties to the extent set forth in these resolutions on two classes of goods, one upon wire rods, an article which is used largely in making wire, and ultimately in making wire nails and manufactures of that character; and also on structural iron and steel. These things are not now made in Canada. They are consumed to a large extent, and the manufacturers have been very desirous that we should so frame our legislation as to encourage the development of these lines of industry. Therefore, instead of dealing with the tariff as already mentioned, we propose to make grants of bounties on the articles which I have named: On rolled round wire rods not over three eighths of an inch in diameter, when sold to wire manufacturers for use in making wire in their own factories in Canada, a bounty of \$6 per ton. Then we proceed: On rolled angles and other forms of structural iron, a bounty of \$3 per ton. In the adjustment of these bounties regard is had to the existing conditions of the tariff. Whatever differences of opinion we may have as to the effect of duties, I suppose it will be generally acknowledged that the duty is an advantage to the manufacturer, and if he does not get it in the form of a duty but in the form of a bounty, he certainly receives considerable advantage. If he is already receiving a large advantage in the shape of the tariff, then there would be less reason for giving him a large advantage in the shape of bounties. In dealing with these articles of goods we are dealing with items which are either on the free-list, as in the case of wire rods for the manufacture of wire and wire nails, and in the case where rods are free for that purpose, or as in the case of structural iron and steel where the duty is a low one of ten per cent. We have reason to believe these grants in aid of the iron and steel industry, while they may fall short of what some manufacturers desire—for it is too much I suppose to hope that we should be able entirely to satisfy applicants who come to us in matters of this sort—we have some reason to believe that these grants will be regarded by the manufacturers as a moderately satisfactory encouragement. At all events they will serve the purpose of enabling industries whose position was somewhat in question a short time ago, to continue their operations, and not only to produce pig-iron and steel as they have been producing in the past, but also to make some progress in the more advanced operations by turning out these wire rods and structural iron, and the various other items mentioned in the resolution.

I have already indicated what the charge upon the treasury will probably be by reason of the change which we are making in the bounties as respects pig-iron and steel. What the charge will be for these new bounties which are providing, is not easy of determination. The best we can do is to call attention to the imports of these articles, and perhaps we can form some

estimate of the quantity of the goods which are likely to be manufactured in Canada.

Mr. BLAIN—Might I ask the Minister of Finance if that includes every thickness of wire and steel?

The MINISTER OF FINANCE—No, if my hon. friend will read the resolution he will see it is very carefully drawn in that respect; it is drawn, as I have already said, with regard to existing tariff legislation. There are some forms of steel which have a considerable duty upon them, and we do not in that case propose to allow any bounties. There are others which are either on the free list or subject to quite a low duty, and it is in the case of articles which are subject to a low duty that we are allowing these bounties. There is a difference in the matter of plates as to the size. Now, as to what the probable charge will be, the only method that we can have of forming an opinion is by taking the imports of the articles in question, and forming, if we can, some estimate as to what proportion of these articles will be made in Canada instead of being imported. I have prepared a statement of the imports of these articles which will show approximately the probable amount we might make in Canada. The imports last year of wire rods amounted to 55,182 tons; the imports of structural iron and plates amounted to 47,512 tons. What proportion of this we might be able to manufacture in Canada is of course a matter of conjecture, it is difficult to form any understanding

Hon. Mr. HAGGART—Do steel rods include steel nails?

The MINISTER OF FINANCE—No, the wire rod is the first form towards the production of steel. We pay no bounty except upon the wire rod itself.

Mr. KEMP—May I ask the hon. Minister of Finance to give us the values as well as the tonnage of these articles imported?

The MINISTER OF FINANCE—The value of heavy angles, structural steel as it is generally described, imported during the year 1902 was \$789,644; of plates imported, \$571,291; and of wire rods imported, \$1,523,792.

Mr. BORDEN (Halifax)—Before the hon. gentleman leaves that I would like to ask a question. He gave us a statement of 55,182 tons which I understand applies to paragraph (a) of the resolution, and he gave us 47,512 tons, but I did not quite understand whether that applies to paragraph (b) and (c) together or only one of them.

The MINISTER OF FINANCE—Yes, it includes everything except rods amounting to 55,812 tons. The other item covers the remainder of the resolution.

Mr. BORDEN (Halifax)—You have separated (b) and (c) as to values?

The MINISTER OF FINANCE—Yes, I have a statement showing the values, the figures of which I have just given. If we manufactured in Canada one-third of the quantity of these articles which were imported in the year 1902 then we shall pay bounties to the extent of \$150,000 a year. If we manufactured two-thirds of the amount we imported we would pay bounties to the extent of \$300,000 a year. Some little time will elapse probably before the manufacturers will have their mills equipped for the manufacture of these articles and I think we are probably within the mark when we say that the year's output will not exceed one-third of the import. That is only a matter of judgment and perhaps a matter of guess. Hon. gentlemen who have the information before them may form an opinion as to whether it is correct or not.

Mr. BORDEN (Halifax) There is no period of time during which the bounties shall continue fixed by the resolution?

The MINISTER OF FINANCE—No, we have thought it better for the present that we should not name the period and for this reason that where you name the period of the bounty you, in a sense, create a contract with the parties entering into these operations under which you would feel that you were bound to continue these bounties for the full term of the contract so called. We have thought it better to leave the matter indefinite so that the House will be entirely free to deal with the question at any future date in connection with any revision of the tariff that may be made. On the whole we think it is better that this bounty should not be offered for a specified time because it might create something like a specific contract. Our impression is that considering that it will take the companies several months before they can get into operation to earn these new bounties we probably would not be very far astray if we were to say that they will not during the current year produce more than one-third of the quantity imported during the year, the figures for which I gave, and if that is so we pay about \$150,000 in the form of bounties on the new articles and there would probably be the same proportion of increase in the bounties on pig-iron and steel. These are



the leading facts of the matter and with that statement we beg to submit the resolution to the consideration of the House.

Mr. WILSON—Would the hon. gentleman be kind enough to give us a statement of the changes made since the present government came into office in the bounty on iron and steel and the change in the duty if any?

The MINISTER OF FINANCE—In 1897 there was an increase of the bounties on pig-iron and steel at which time there was a reduction of the duty—I cannot give the exact figures in regard to all the details—but there was a reduction of from \$4 to \$2.50 a ton on pig-iron and steel, and of course a further reduction under the preferential tariff. The bounties at that date were increased to compensate the industry for the disturbance which otherwise would have been created by a reduction in the duties.

Mr. WILSON—Would the hon. gentleman bring down a statement of those changes?

The MINISTER OF FINANCE—I shall be glad to bring down a statement in detail showing the change made in each of these items.

Mr. KEMP—I should like to ask the hon. Minister of Finance why it was that he came to the conclusion that the items of plates, steel ingots, puddled iron bars, and pig-iron should be dealt with on the bounty basis instead of by imposing a sufficient duty.

The MINISTER OF FINANCE—Because, as I stated earlier in the session, a change in the duty on articles of this kind which are the very basis of a great many manufacturing industries would probably involve material tariff changes and we did not deem it in the interest of the country to make such changes at present.

Mr. KEMP—Shall we draw the conclusion from that that later on these articles may be protected by a duty and the bounties taken off?

The MINISTER OF FINANCE—The matter will be purposely left entirely open to the House so that it may deal with it in that way. It is quite possible, but of course, we can make no undertaking in regard to the future.

Mr. BORDEN (Halifax)—I am sure that we can all congratulate the hon. Minister of Finance (Hon. Mr. Fielding) on having awakened to a realization of the condition of iron industry in this country. He did not seem to be very fully alive to it at the commencement of the session when we were told that the only difficulty in regard to all our Canadian industries was that there were not sufficient men for the purpose of carrying on the work and that the warehouses were not large enough to contain the manufactured product.

The MINISTER OF FINANCE—Not as to all.

Mr. BORDEN (Halifax)—I have a pretty vivid recollection of what the hon. gentleman stated and I do not remember of any exception. If he made any exception I am sure he will be glad to correct me as he will have an opportunity of doing. I think we might also congratulate ourselves that the right hon. leader of the government as well as the right hon. Minister of Trade and Commerce, those redoubtable free-traders, took occasion to leave the House while the hon. Minister of Finance was making his statement realizing no doubt that a bounty is the most extreme form of protection and that the measure which is now being brought down by the hon. Minister of Finance is absolutely out of touch with the principles which these right hon. gentlemen up to a very late date, in fact up to the present session, have announced to the House and to the country as their political creed. Under the tariff which was established by the late government when Sir Charles Tupper was Minister of Finance, some progress was made in the iron industry and I have no doubt a very much greater development would have taken place except for the fact that the price of pig-iron fell all over the world and the development which might have been expected in Canada at that time did not take place. This government introduced its tariff in 1897 and I have already given the House the particulars of the decreases made in the iron duties at that time so that it will not be necessary to go over them again. It is sufficient to say that the decrease was very considerable in regard to many of these items. For example, on pig iron there was a reduction to \$1.50 per ton on scrap (cast); a reduction to \$1.50 per ton on billets and blooms; a reduction to \$3 on scrap (wrought); a reduction of \$3 on steel beams to \$3; on steel bands to \$2; on steel fish and tie plates to \$2; on plates to \$3; on shaftings and forgings, a very considerable reduction, and so on through all the list which I then read to the House.

Very shortly afterwards this Government came to the conclusion that so serious a reduction in the duties on iron and steel was a mistake, and that that mistake might be remedied by acclamation of the bounties; and the measure with regard to the bounties was brought down, although in proposing it the Government went back on all previous professions of policy

which it had preached to the country for eighteen years in regard to bounties. I need only, in that connection, refer to the language of the present Minister of Trade and Commerce (Rt. Hon. Sir Richard Cartwright), both with regard to duties on iron and steel and with regard to bounties. In 1890 the Rt. Hon. Sir Richard Cartwright said to this House:

I doubt exceedingly whether among the many injurious duties which the policy of the present Government has heaped on the producers of this country, there is one which is calculated to do more harm on a larger and wider scale than the enormous duties which have been placed upon iron.

Then this Government, having reduced the duty on iron, proposed immediately afterwards to equalize to some extent the advance which they made in that direction by bringing down their bounty scheme a few years ago. But the Minister of Trade and Commerce, on the occasion to which I refer, continued as follows:

There is just this advantage in the proposition that to a certain extent it enables the people to see more clearly than in other cases how much the exchequer has been plundered because plunder it is and how much the people are being impoverished by this policy.

It is pleasing to know that the Minister of Trade and Commerce, at the present time—I regret he is not here to-day—joins most heartily and cordially in this measure for the impoverishment of the people in placing bounties on iron and steel. The Rt. Hon. Sir Richard Cartwright continued as follows:

This is merely a concession to certain favoured individuals, or certain favoured corporations to be paid for in all human probability by contributions to elections funds, just as we know that other combines are in the habit of earning the gratitude of hon. gentlemen opposite.

Well, I do not know whether any comment is required on this or not. It would be, I suppose, out of place to ask my hon. friend the Minister of Finance whether there is any connection between the bringing down of this measure now and the reported approach of the general elections, having special regard in that behalf to the language which I have quoted from the Minister of Trade and Commerce. When it came to a question of bounties four years later, in 1894, the present Minister of Trade and Commerce (Rt. Hon. Sir Richard Cartwright) thought the proposition was so absolutely absurd that he refused to discuss it at all. He said:

I am not going to raise a discussion now as to bounties on pig-iron. I disapprove of the whole business altogether.

And he brushed it aside with a waive of his hand, and now his colleague, the Minister of Finance, brings down this resolution with the approval of the Minister of Trade and Commerce, but happily in that right hon. gentleman's absence at the moment.

Some hon. MEMBER. Hear, hear.

Mr. BORDEN (Halifax). The late Conservative Government, and particularly Sir Charles Tupper, when he was in that Government, were extremely anxious that this industry should be developed in Canada; and I have more than once referred, not in this House, but out of this House, to an incident which took place when Sir Charles Tupper was made aware that the Government proposed to give bounties to this industry. I remember very well the occasion, and I remember very well what Sir Charles Tupper said. He said he was glad that the Government had done it, and he added with some emphasis: He was glad indeed that the Government had done it, even though it should have the effect of giving them another five years in power. That is the aspect in which Sir Charles Tupper looked at this industry in this country, and it is not out of place at the present time to say that Sir Charles Tupper, by the stand which he took with regard to this industry at that time, both openly in this House and by means of negotiations outside of the House, contributed very largely to the establishment of these bounties, and in that way to the development of the iron and steel industry in the maritime provinces. And, as some time ago, I think at the very time these bounties were introduced, there was certain correspondence read in this House, by means of which it was sought to discredit Sir Charles Tupper's statement as to the part which he had taken in this matter, it is not out of place now for me to read a communication addressed to Mr. Henry M. Whitney, whose name was brought into that discussion; and addressed to him, not at the instigation of Sir Charles Tupper, but quite independently of him, by a gentleman who had very excellent means of knowing what share Sir Charles Tupper had in these negotiations—I refer to Mr. Graham Fraser, whose experience in the iron industry, and whose efforts in developing that industry in the maritime provinces are well known throughout Canada. This is the letter to which I refer:—



H. M. Whitney, Esq.,  
95 Milk Street,  
Boston, Mass.

New Glasgow, N.S.,  
September 5th, 1900.

Dear Sir,—In the Halifax 'Morning Chronicle' of Saturday, September 1st (cutting from which I mail herewith), I notice an article referring to a discussion carried on in the Canadian Parliament, Ottawa, during last session by the Hon. W. S. Fielding and Sir Charles Tupper relative to the extension of the iron bounties, &c.

Owing to my absence in Great Britain when the discussion took place, I knew nothing of it until reading the article in last Saturday's 'Chronicle.' As my name comes up somewhat prominently in the matter, and as I think your letter is hardly fair to Sir Charles, I consider it my duty to state the facts as I know them.

By referring to my notebook, I find that on November 24th, 1897, I met you at your office in Boston, when we had some conversation relative to a supply of coal for a furnace plant which the Nova Scotia Steel Company proposed to establish at Sydney or Louisburg. On November 25th I went to Philadelphia and returned on Saturday the 27th, and again met you in your office and then gave you some figures as to the cost of making iron in Cape Breton. You then suggested a larger plan than outlined in our proposal. On Monday, November 29th, I saw you again, when you spoke in a very enthusiastic way of the proposed blast furnace project, and we then arranged for 10,000 tons of Cape Breton coal for coking test at the Ferrona works. At that interview you stated that if the tests proved satisfactory and we could get the Dominion iron bounty extended for five years from the time the furnaces went into blast, you would join us in the enterprise and help us get the necessary capital. This was said in the presence of Mr. Windsor, the vice-president of the Dominion Coal Company.

The 10,000 tons of coal was shipped to Ferrona, the test proved satisfactory, and on January 25th, 1898, I again met you in Boston, when the results of the coking tests were submitted to you. You then suggested that legislation be at once got from the Government of Nova Scotia incorporating a company and that in the meantime the Nova Scotia Steel Company should, through their solicitor and agents, do all they could to induce the Dominion Government to extend the bounties.

We did secure from the Nova Scotia Legislature an Act incorporating the company (The Nova Scotia Steel and Iron Company, Limited), but entirely failed to get during that session of the Dominion Parliament any legislation extending the bounties, and on June 4th, 1898, I wrote you as follows: 'I regret to inform you that we did not succeed in getting the Bill through Parliament extending the bounties on pig-iron; so the matter of erecting furnaces at Sydney or Louisburg is, I suppose, off for the present.'

I heard nothing more from you until I received a telegram asking me to meet you at Sydney on the 17th of August, which I did. You then stated that you thought we had better go on with our new works as you did not believe the Dominion Government would extend the bounties, and as Sir Charles Tupper was going over to England you would get him to introduce us to parties who would find the capital. In reply, I said: 'If you begin to build the large plant you are taking of, I do not believe the bounties will ever be extended. Sir Charles came in later, when you repeated to him our conversation. Sir Charles then said: "Mr. Fraser is quite right about the bounties. You should get the Finance Minister to get an Order-in-Council passed extending the bounties before starting your works—it will be a great help in getting the capital. I will see that there will be no opposition to it from the Conservative party, and I will see Mr. Fielding and take up the matter personally." When I saw Sir Charles about a month later, namely, September 16th, at the Windsor Hotel, Montreal, in the presence of yourself and Senator Mackeen, he told us that he did see Mr. Fielding at the Royal Hotel, St. John, and had a discussion with him in regard to the matter of extending the bounties.

Now, in view of the above facts you can hardly say that you were not interested in the iron and steel business at the time Sir Charles Tupper referred to, namely, August 17th, 1898. While we personally did not visit Ottawa to interview Mr. Fielding on the bounty matter, he was approached at your suggestion by the agents of the Nova Scotia Steel Company and also, I understand, by Messrs. W. B. Ross and B. F. Pearson, of the Dominion Coal Company, but without result at that session.

I well know that you are a busy man and unlikely to recall conversations such as referred to with the dates on which they took place, but when I repeat them to you as above you will, I think, recall them and agree with me as to their accuracy, and I know that you are fair enough to give Sir Charles credit for the part he took in securing such bounty legislation as was finally passed, although it is not as favourable as you asked for, namely, 'five years from the date at which the furnace went into blast,' as provided by the Bounty Act introduced by the late Finance Minister, Hon. George E. Foster, during the session of 1894.

The difference it would make to your company you can no doubt appreciate, as it would have been unnecessary to rush construction at excessive cost.

Don't you think that some acknowledgment should now be made to Sir Charles?

The favour of your early reply will oblige.

Yours respectfully,

(Sgd) GRAHAM FRASER.

To that letter Mr. Whitney sent the following reply:—

Boston, September 7th, 1900.

Graham Fraser, Esq.,  
New Glasgow, N.S.

Dear Sir,—Replying to your letter of the 6th instant, I have to say that I am well aware that Sir Charles Tupper was always friendly to the extension of the iron and steel bounties and gave to the proposed bounty legislation his hearty support.

The statement which I felt obliged to correct in my letter to Sir Charles was that Mr. Fielding was unfriendly to the matter and that I visited Ottawa with you and implored Mr. Fielding 'to extend that measure of assistance

necessary to the organization of this great enterprise and that we went home utterly discouraged.'

As you yourself say this was not true of either of us; and, so far as my expression goes, Mr. Fielding was, as I stated in my letter, 'friendly to the matter of the extension of the bounty period from the time of my first mention of the subject to him.'

Yours truly,

H. M. WHITNEY.

I thought it was only fair to Sir Charles Tupper that this letter, written not at his instigation, written entirely without his knowledge, should be brought to the attention of the House, as other correspondence from Mr. Whitney was at the time introduced into this House for the purpose of somewhat contradicting Sir Charles Tupper as to the share he had taken in the legislation at that time.

Now, coming to the proposal of the government, I regard it as a mere makeshift, a mere temporary expedient. I believe the iron industry of Canada can never be put upon a permanent basis until the duties are so revised as to give the home market, to a large extent at least, to our own people. That, the government's present proposal will not do. The effect of a bounty and the effect of customs duties are very distinct. If by means of customs duties you can give the home market to our own people and in that way build up the production of iron and steel in Canada, the result will be that the competition thus stimulated in our own country will reduce the prices of the products to a fair and reasonable basis, and eventually there will be no burden on the people at all, because they will get their iron goods in Canada as cheaply as they can get them in any other country. But the effect of the bounty is precisely the opposite. The more you develop the industry by means of a bounty, the greater burden you impose on the people. If you increase the production four-fold by means of a bounty, you increase the burden of the people four-fold. Now, there is good reason, it seems to me, for endeavoring to give our people the home market in respect to this great industry. I do not disguise from myself, nor does the hon. Minister of Finance, disguise from the House, the necessity, in case the duties on iron and steel are revised, of revising the duties on other articles which are intimately associated with the use or the production of iron and steel. But is our home market worth anything? It is estimated that we used during the past year more than 800,000 tons of iron and steel, of which we imported 544,548 tons produced by blast furnaces and rolling mills of other countries. Surely there should be some opportunity for our own manufacturers to acquire the control of a market like that. We imported last year \$33,681,625 worth of iron and steel and manufactures thereof. A considerable portion of those goods could be and ought to be manufactured in Canada. But I submit to the House, and particularly to the Minister of Finance, that it is impossible to give to our manufacturers the home market by a simple system of bounties such as that which he is proposing at the present time. My hon. friend has referred to a possible revision of the tariff in the future. Indeed, he has put these resolutions in such a form as, coupled with his remarks, to suggest that possibly he may be looking forward to a revision of the tariff at an early date. I would have thought, as I suggested at an early part of the session, that it would have been better to make a revision of the tariff at once, and not resort to this makeshift and temporary expedient, which will have to be abandoned if the iron and steel industry of Canada is to be put on a permanent basis. If that result is achieved, it can only be done by a very thorough revision of the tariff on these articles. I do not know whether the hon. Minister of Finance has any understanding with the manufacturers of iron and steel with regard to that. The way in which he has dealt with the matter in the House would seem to give colour to that supposition. While I am glad that these resolutions have been brought down and that this small measure of protection has been given for the purpose of aiding and developing this great industry, nevertheless I regret that my hon. friend has not seen fit to adopt the only means by which in my opinion this industry can be put upon a permanent basis in this country, that is, a revision of the customs tariff in such a way and to such an extent that the Canadian producers will enjoy the Canadian market. I still trust that the government will take the very earliest opportunity—I am afraid they will not have any opportunity if they do not begin very soon—to give adequate assistance to the iron and steel industry in the way I have mentioned. \* \* \* \*

After a lengthy discussion in which many members took part including Messrs. Tarte, Monk, Gourlay, Lennox Bennett, Henderson, Bell and others the resolution was read the first and second times and agreed to.

Mr. H. B. Ames, a wealthy manufacturer of Montreal, and also a large stockholder in the Payne Mining Company, is on a visit to British Columbia, looking after his varied mining interests.



## MINING NOTES.

**The Inverness Ry. and Coal Co.**—This company's output of coal for the half year ending June 30th, 1903, is much in excess of the output for the corresponding period in 1902. In fact it is understood that the shipments during the time mentioned were only a few thousand tons less than the total shipments from the county of Inverness during the whole of last year.

**Nova Scotia Steel and Coal Co.**—The output of coal made by this company at Sydney mines during July was very much decreased owing to the fact that about 4% of the employees seemed inclined to take a few holidays during the heated term. The result was that only half the usual amount of coal was hoisted. The night shift in No. No. 1 Sydney has been laid off and equally good results are expected to result from the remaining shifts. Some of the miners have gone to work in other collieries because of the difficulty encountered in removing the coal from the face.

**Belmont Gold Mine.**—Reports from Hastings county are to the effect that this mine will increase its present development of 1,000 horse-power in the near future and bring its present plant of 30 stamps up to a total of 120.

**The Canada Corundum Company.**—According to late advices this company which is at present operating quite extensively and employing upwards of one hundred men, will in the near future increase the capacity of its plant which is now 20 tons to a daily output of 200 tons.

**The Sapphire Corundum Company.**—A compulsory winding-up order having been made against the Sapphire Corundum Company, Ltd., the statutory meetings of the creditors and shareholders were held on Tuesday, July 28th, at the Board of Trade Offices, Carey Street, London, before the Assistant Official Receiver. Accounts have been filed under the liquidation showing liabilities £3 096, against assets valued at £112,259, but a deficiency of £805,845 to the contributories. The failure and insolvency of the company were attributed by the officials to want of working capital. Since the date of the winding-up order, various Canadian creditors had obtained judgment against the company, under which the property had been seized, and the High Court of Justice in Canada had now made an order to wind up the company, such order to be ancillary to the order of the High Court in England. At the meeting of creditors, Mr. W. H. Hudson, Broad Street House, New Broad Street, London, E.C., was selected to act as liquidator with a committee of inspection.

**Crow's Nest Pass Coal Co.**—The output of coal from the various collieries of this company for July amounted to 71,462 tons an increase of 209 tons. The output was seriously affected by holidays during the month as it is estimated that had no interruption occurred the production would have reached about 80,000 tons. For the two weeks ending August 14th, the output amounted 33,202 tons. The coke shipments during July from the ovens at Fernie and Michel came to 16,335 tons. These are the largest shipments so far made in any one month. Some of the new ovens at Morrissey are now in operation and shipping has begun.

**The International Coal and Coke Co.**—The first shipment of coal from the mines of the International Coal and Coke Co., at Blairmore, Alberta, was made towards the end of July, when one carload of coal was shipped to Phoenix. The coal will be used for operating the steam shovel in the surface quarries of the Granby mines. Another carload of coal has been received at the Granby smelter. Although work at the coal mines is only at the initial stage, about twenty-five miners are employed and two carloads of coal being taken out daily in course of daily development.

**War Eagle Consolidated.**—The following despatch has just come to hand from Rossland, B.C.: "The War Eagle mine is on fire at the thousand feet level station. The timbers were ignited presumably by a candle left burning. When discovered smoke and fumes prevented anyone approaching the seat of the fire, and General Manager Kirby and Superintendent Davis suffered considerably from smoke and gas in endeavoring to reach the scene of trouble. An effort to go down was abandoned as the shaft was sealed up at the 900 feet level. The blocking of the air was expected to extinguish the fire with the steam vapor now being introduced in large quantities. A portion of the upper level was not interfered with, and the company will not lose heavily. The fire is practically unprecedented in the history of Rossland."

**The Velvet Mine.**—The Velvet mine has suspended operations indefinitely. The management has made no statement, but it is generally understood the suspension, which will be of long duration, is occasioned by the fact that the payable ore under existing conditions is exhausted, and the London directors have declined to put up funds necessary for further operations on a considerable scale.

**Granby Consolidated Mines.**—A despatch from Phoenix, B.C., to the Nelson News dated the 8th instant, says:—With this week's tonnage the Granby mines' ore shipments for the year to date run over two hundred thousand tons. Both the B.C. mine and Sunset having closed for the present, they do not appear in this week's shipments, but the Emma in again on the list. Following are the tonnage figures of Boundary shippers for the current week: Granby mines to Granby smelter, 8317 tons; Snowshoe, to Greenwood and Sunset smelters, 1320 tons; Mother Lode, to Greenwood smelter, 2325 tons; Emma, to Trail smelter, 99 tons; Ore Denoro, to Sunset smelter, 517 tons; Athelstan, to Sunset smelter, 60 tons. Total shipments for the week, 12,638 tons. Total for the year thus far, 346,010. The Granby smelter this week treated 8830 tons of ore, making a total of 195,137 tons for 1903 to date.

**The Northwestern Smelting and Refining Co.**—The ore shipments to the Crofton smelter for the month of June were approximately as follows: From Marble Bay, Texada, 1860 tons; from Lone Pine, Republic, 970 tons; from Trade Dollar, Republic, 45 tons; from Comstock, Yreka, Quatsino, 122 tons; from Lenora, Mount Sicker, 3,000 tons; from Redwing, Opper Mountain, Prince of Wales Island, 110 tons; from Van Anda, Texada, 50 tons.

**The Waterloo Mine.**—From Camp McKinney it is learned that the

Waterloo mine has in 40 day running produced gold bricks valued at \$8,000. Operations were started on June 16th but many shut downs have been made in the interval. The mill with five stamps is treating about 12 tons daily. From shipments of high grade ore to the smelter at Trail nearly \$4,000 has also been received. A carload of concentrates is going out before the end of August.

**The Ymir Gold Mine, Limited.**—A London cable as to the mine's June return says: "Seventy stamps ran 28 days and crushed 4,950 tons (2,000 lbs.) of ore, producing 1,163 ozs. bullion. The estimated realisable value (gross) of the product is \$12,850; 300 tons of concentrates shipped, gross estimated value, \$7,750; cyanide plant treated, 3,050 tons (2,000 lbs.) of tailings, producing bullion having estimated gross value of \$2,150; sundry revenue, \$1,060—\$23,810; less working expenses, \$21,000 profit, \$2,810. There have been expended during the month on development, \$5,000.

**The Le Roi Mine.**—A recent cable to the London Board says: "Shipped from the mine to the Northport smelter during the past month, (June) 11,289 tons of ore, containing 4,500 ounces of gold, 4 480 ounces of silver and 227,700 pounds of copper. Shipped from the dump to Northport smelter during the past month, 5 tons of ore containing 26 ounces of gold, 36 ounces of silver and 927 pounds of copper. Estimated profit on this ore, \$8,000."

**The Silver King Mine.**—From Nelson, B.C., comes the report of a strike made early in the month at the Silver King mine. The owners of the property—The Hall Mines Co. Limited—shut down over a year ago, as after considerable work on the lower levels done by the diamond drill, the results proved rather unsatisfactory. Shortly afterwards, Mr. M. S. Davys, formerly in charge of the company's operations, took the mine on lease and worked on a small scale for several months. About this time, while operating on the fifth level, a rich stringer of ore was encountered which gave values sufficient to pay all working expenses and leave a very respectable margin of profit besides. The work being continued along this stringer has now broadened out into a lead said to be nearly five feet wide with walls very clearly defined. Thirty-eight men are now at work and it is expected that this force will be largely increased almost immediately. When working full strength the company formerly employed from 170 to 190 men.

**The Bosun Mines, Limited.**—The manager of this mine reports by cable to the Board of Directors in London that the shipments made during the month of July, were 20 tons of galena and 80 tons of zinc.

## NEW COMPANIES.

### BRITISH COLUMBIA.

**Dandy and Ollie Consolidated Mines, Limited.**—Incorporated under the statutes of British Columbia, 11th May, 1903. Authorized capital \$500,000, in 1,000,000 shares of fifty cents (50c.) each. Formed to acquire the properties known as "The Dandy and Ollie Consolidated Mines, Limited."

**Pilot (Ymir) Gold Mining and Milling Company, Limited.**—Incorporated under the statutes of British Columbia, 11th May, 1903. Authorized capital \$50,000 in 500,000 shares of ten cents (10c.) each. Formed to acquire the properties known as "The Pilot (Ymir) Gold Mining and Milling Company, Limited."

**Selkirk Copper Mines, Limited.**—Incorporated under the statutes of British Columbia, 15th May, 1903. Authorized capital, \$500,000, in 500,000 shares of one dollar (\$1.00) each. Formed to acquire the properties known as "The Selkirk Copper Mines, Limited."

**Wagner Mines, Limited.**—Incorporated under the statutes of British Columbia, 9th May, 1903. Authorized capital \$2,000,000, in 2,000,000 shares of one dollar (\$1.00) each. Formed to acquire the properties known as "The Wagner Mines, Limited."

**British Columbia Standard Mining Company, Limited.**—Incorporated under the statutes of British Columbia, 11th June, 1903. Authorized capital \$200,000, in 200,000 shares of one dollar (\$1.00) each. Formed to acquire the properties known as "The British Columbia Standard Mining Company, Limited."

**Aztec Mining Company, Limited.**—Incorporated under the statutes of British Columbia, 25th June, 1903. Authorized capital \$15,000, in 15,000 shares of one dollar (\$1.00) each. Formed to acquire the properties known as "The Aztec Mining Company, Limited."

**Western Oil and Coal Company, Limited.**—Incorporated under the statutes of British Columbia, 8th June, 1903. Authorized capital \$1,000,000, in 1,000,000 shares of one dollar (\$1.00) each. Formed to acquire the properties known as "The Western Oil and Coal Company, Limited."

### ONTARIO.

**Temiscaming and Hudson Bay Mining Company, Limited.**—Incorporated under the statutes of Ontario, 29th July, 1903. Authorized capital \$25,000, in 25,000 shares of one dollar each. Directors—G. Taylor, A. McKelvie, A. I. Ritchie, E. P. Smith, A. Burwash, T. McCamus, J. Bancroft, J. J. Grills, D. T. K. McEwen. Head Office—New Liskeard, Ont. Formed to acquire the properties known as "The Temiscaming and Hudson Bay Mining Company, Limited."

**Peninsular Oil and Gas Company, Limited.**—Incorporated under the statutes of Ontario, 15th July, 1903. Authorized capital \$100,000, in 400,000 shares of twenty-five cents each. Directors—A. McCallum, E. A. Mounteer, A. J. Bedford, F. T. Merrill, G. Smyth. Head Office—Chatham, Ont. Formed to acquire the properties known as "The Peninsular Oil and Gas Company, Limited."

**Eagle Copper Company.**—Incorporated under the laws of the State of Michigan, and licensed under the statutes of Ontario, 17th June, 1903. Authorized capital for use in Ontario, \$50,000. Frederick Rogers, Sault Sainte Marie, Ont., Attorney. Formed to acquire the properties known as "The Eagle Copper Company."



**Wakefield Mica Company, Limited.**—Incorporated under the statutes of Ontario, 22nd June, 1903. Authorized capital \$50,000, in 500 shares of one hundred dollars each. Directors—C. E. D. Chubbuck, K. B. Holland, H. M. Johnson, T. R. Kennedy, C. A. Johnson. Head Office—Ottawa, Ont. Formed to acquire the properties known as "The Wakefield Mica Company, Limited."

**New York and Lake Erie Oil and Gas Company, Limited.**—Incorporated under the statutes of Ontario 22nd June, 1903. Authorized capital \$1,000,000, in 1,000,000 shares of one dollar each. Directors—C. L. Meyer, J. W. Lovell, W. B. Lightfoot, J. W. Fox, A. H. Clarke. Head Office—Windsor, Ont. Formed to acquire the properties known as "The New York and Lake Erie Oil and Gas Company, Limited."

**Hermine Mining Company, Limited.**—Incorporated under the statutes of Ontario, 17th June, 1903. Authorized capital \$2,500,000, in 500,000 shares of five dollars each. Directors—J. Hermann, P. Primeau, H. Appleton, O. J. Larson, W. H. Green, J. A. McPhail, L. Sibilsky. Head Office—Sault Sainte Marie, Ont. Formed to acquire the properties known as "The Hermine Mining Company, Limited."

**Cluxton Oil and Gas Company, Limited.**—Incorporated under the statutes of Ontario, 10th June, 1903. Authorized capital \$100,000, in 50,000 shares of two dollars each. Directors—F. C. Cluxton, A. B. Booth, R. J. Gaffney, P. D. McKellar. Head Office—Chatham, Ont. Formed to acquire the properties known as "The Cluxton Oil and Gas Company, Limited."

**King Edward Mine, Limited.**—Incorporated under the statutes of Ontario, 10th June, 1903. Authorized capital \$200,000, in 20,000 shares of ten dollars each. Directors—A. S. Burrows, J. S. Dobie, W. R. Smyth, C. J. Brown, B. G. Coryell. Head Office—Bruce Mines, Ont. Formed to acquire the properties known as "The King Edward Mine, Limited."

**Loon Lake Iron Company, Limited.**—Incorporated under the statutes of Ontario, 10th June, 1903. Authorized capital \$3,000,000, in 600,000 shares of five dollars each. Directors—J. F. Carey, G. Wagner, S. B. Martin, P. J. Hart, J. L. O'Flynn. Head Office—Sault Ste. Marie, Ont. Formed to acquire the properties known as "The Loon Lake Iron Company, Limited."

**Vermillion Bay Mines Company.**—Incorporated under the laws of the State of Delaware, and licensed under the statutes of Ontario, 10th June, 1903. Authorized capital for use in Ontario, \$50,000. Newton Higbee, Rat Portage, Ont., Attorney. Formed to acquire the properties known as "The Vermillion Bay Mines."

**Bussman-Gray Molybdenum Mining and Reduction Company of Ontario, Limited.**—Incorporated under the statutes of Ontario, 31st July, 1903. Authorized capital \$1,000,000, in 1,000,000 shares of one dollar each. Directors—P. F. Bussman, W. J. R. Gray, C. R. Gray, T. A. Hyland, W. L. Baker, R. M. Choate. Head Office—Fort Erie, Ont. Formed to acquire the properties known as "The Bussman-Gray Molybdenum Mining and Reduction Company of Ontario."

**Long Lake Gold Mining Company, Limited.**—Incorporated under the laws of the Imperial Parliament of the United Kingdom of Great Britain and Ireland, and licensed under the statutes of Ontario, 31st July, 1903. Authorized capital for use in Ontario, \$25,000. P. E. Mackenzie, Rat Portage, Ont., Attorney. Formed to acquire the properties known as "Long Lake Gold Mining Company, Limited."

## PERSONAL MENTION.

Mr. G. R. Atkinson, formerly of the Athabaska Gold Mining Company, and the London and British Columbia Gold Fields Company, at Nelson, B.C., has gone to Siberia, where he will enter the service of a large Copper Company, developing extensive properties in that country.

Dr. Joseph Struthers, who has been for some time connected with the Engineering and Mining Journal, of New York, as associate editor, has resigned his position to accept that of assistant to Dr. Rossiter W. Raymond, secretary of the American Institute of Mining Engineers.

Mr. Justice Britton of Kingston, and Mr. B. T. A. Bell, of the Canadian Mining Review, Ottawa, who were recently appointed as commissioners to investigate the charges of illegality in connection with the securing of the Treadgold and other mining concessions in the Yukon, have arrived in Dawson City. The commission opened its session at 11 o'clock on the 17th inst., when the reading of the terms of the commission and an explanation of the scope of the inquiry was made.

Mr. A. P. Lowe, of the Geological Survey Department, who has explored the Labrador region and spent considerable time in the Ungava Bay district and along the Hudson Bay coast, has left Halifax in charge of the Dominion Government expedition, lately fitted out by the Department of Marine and Fisheries.

Mr. W. Sandford of Sydney, New South Wales, a gentleman largely interested in Australian iron deposits, where he is the owner of the Esbank Collieries and the Esbank Iron Works at Lithgow, New South Wales, is on a visit to Canada. He is looking more particularly into the bounty system as applied to our iron and steel industries with a view to discovering whether that system is the best method of assistance that can be given to the industry in his own country.

Mr. T. G. Blackstock, K.C., of Toronto, managing director of the War Eagle-Centre Star Companies, is on a visit to the Slocan district, and will spend some time in looking after the various properties with which he is connected.

Mr. R. Roscoe Leslie, who has been superintendent of the Le Roi mine during the past year, has resigned his position with the company to devote his attention to mining interests elsewhere. His successor will be Mr. Robert H. Anderson, at present manager of the Oro Denoro and B. C. mines in Summit Camp. The change will take place about the end of the present month.

Sir James Hector, K.C.M.G., an eminent geologist and the discoverer of the famous Kicking Horse Pass through the Rocky Mountains, is on a visit to Canada. Sir Hector is at present Chancellor of the New Zealand University and Director of the Colonial Museum and Observatory and the New Zealand Institute.

Mr. W. A. Carlyle, Managing Director of the Rio Tinto Copper Mines, one of the largest and oldest in Europe, is on a visit to Canada. Mr. Carlyle will not return to Spain until October.

Dr. Eugene Haanel, Dominion Superintendent of Mines, has returned from a visit to Lockport, N.Y., where in company with prominent capitalists he has been witnessing secret tests of the electric furnace, invented by Marcus Ruthenbourg, which have been going on at the Cowles Electric Smelting and Aluminum Works. No information as to the success or otherwise of the experiments has so far been given out.

Dr. Robert Bell, acting Director of the Geological Survey Department, sailed for Europe early this month. He will travel to Vienna, Austria, where, as envoy of the Dominion Government, he will attend the session of the International Geological Congress which takes place during the present month. On behalf of the Government and Royal Society of Canada, he is the bearer of an invitation to the Congress to hold its tenth triennial session (which falls in 1906) in Ottawa.

## CONCENTRATES.

The total number of persons employed in and about all the mines of the United Kingdom during 1902, was 855,603, of whom 824,791 worked at the 3,349 mines under the Coal Mines Act, and 30,812 at the 703 mines under the Metalliferous Mines Act. Compared with 1901 there is an increase of 18,056 persons at the mines under the Coal Mines Act, and a decrease of 1,631 persons at the mines under the Metalliferous Mines Act.

An Associated Press despatch from St John's, Newfoundland, dated August 18th, states that several of the larger slate quarry firms at Trinity Bay are planning to move to this colony their business at the Welsh quarries, which have become almost exhausted except for deep mining. One quarryman has under consideration plans for the removal of an entire town near his Welsh quarry to Newfoundland, where he can give three thousand men employment. The Welsh slate has been known as the best in the world, but experts who are prospecting and working the Newfoundland beds on Trinity Bay and the Bay of Islands say the Newfoundland slate is superior to the Welsh, besides being easier to quarry and almost inexhaustible.

Up to August 5th the gold shipments of the Klondike this year have reached \$5,500,000, which is only \$3,000,000 less than the figure of last year at this time. The total would have been far greater were it not for the big water famine on the gold creeks. The unanimous opinion of all the visiting experts and those of local repute is that the camp must have a large water system for future operations.

It is announced that the Belleville Rolling Mills have been purchased from Messrs. Kirkwood and McKinnon by a syndicate composed of C. E. Carbonneau of Paris, France, Dr. Alf. Wills of Dawson City, and M. Jackson of Paris. It is the intention of the syndicate to at once put the mills in first-class repair and operate them to their full capacity, in which case the owners will secure a bonus of \$5,000 per year from the Belleville corporation.

Advices brought by late steamers arriving at Vancouver from the Antipodes state that the livelihood of 40,000 people is adversely affected by the closing down of the silver-lead mines at Broken Hill, New South Wales, Australia. From news just to hand it appears that Broken Hill is passing through a period the darkest ever known in the history of the Barrier. The failure of the water supply is the cause. The town was face to face with a really desperate situation when the mail left. Five thousand men were thrown out of work and the business people decided to refuse credit because the wholesale houses had suspended the system with them. Most of those who could leave the district were doing so. Water is being brought in by train from South Australia at a cost of \$10 per thousand gallons. A facetious correspondent remarks that whiskey drinkers are rendering valuable assistance in preserving the more precious fluid by taking their whiskey straight.

The Russman & Gray Molybdenum Reduction and Refining Co., of Buffalo, has secured 4,700 acres of mineral lands in northern Frontenac, Renfrew and surrounding district. They expect to open mines and to erect in Kingston a smelter costing \$130,000. It is also the intention of the company to construct a railway from near Tweed to Killaloe Station, on the Canada Atlantic Railway.

Eight large dredging machines are to be placed on the Stewart River next season by the Ogilvie Company. The Company has had its prospecting dredge at work continually this summer and intends to increase its equipment this winter and have it ready for use next season. The new dredges are each to have a capacity of 900 cubic yards in ten hours. Each dredge will cost approximately \$45,000. The big dredge on Discovery on Bonanza, the only large plant of the kind in operation in the territory, has a capacity of 500 yards in ten hours.

The recent reports circulated as to the discovery of an immense body of coal lands in the Peace River District have been confirmed by Mr. Hugh Campbell of Cow Bay, Nova Scotia, who was lately on a visit to the Capital after an extended sojourn in that district. The location which was discovered by Mr. Campbell and his prospecting party is said to be in the district near Hudson Hope, a short distance from the entrance to the Peace River Pass. The area is calculated to contain some 250,000,000 tons, and the seams in some places are said to be nine feet thick.

The Krupp Steel Works of Germany have been reorganized and incorporated as a joint stock company, dating from June 30. The new company



owns the steel works at Essen and Anuen, a firing or gun-proving ground at Meppen, the Gruson works at Buchau, the Germania shipbuilding yard at Kiel, four blast furnace plants, smelting works and machine shops at Sayn, three coal mines, and a number of iron mines in Germany. According to the census of April 1, 1902, the total number of persons employed by the Krupp Works was 41,013, of whom 4,046 were officials.

A wonderfully rich strike is reported from Atlin as having been made towards the end of last month. It is said that Messrs. William and Charles Queen who are located on No. 85 below discovery on Spruce Creek, have struck a pay streak in the benches which quite eclipses anything previously encountered in the Atlin country. The first three pans yielded no less than \$60.60. A Mr. Murdock McKay, who heard of the find, panned out \$27.20 for one single pan. In the next 22 hours sluicing the clean up totalled \$2,365.00 with only four men shoveling into the boxes. As an evidence that the strike on the Queen Bros. property is not the only pay dirt on this well known creek, it may be mentioned that Messrs. Irving Bros. on 83—4 below, who averaged last season over three ounces a day to the man are now taking out 40 ozs. per day with six men working.

In connection with the British Iron and Steel Institute, which will meet at the beginning of September at Barrow-in-Furness, Mr. J. E. Stead says that he will disclose a discovery that will revolutionize the manufacture of steel. He finds that by simply heating dangerously crystalline steel to a certain temperature, however bad the steel, it is possible to restore it to a normal condition and even to improve it.

The deal for the purchase of iron ore lands on the Mesaba range, Minnesota, by the United States Steel Corporation which has been reported occasionally since the first of the year and which was completed some months ago, is now verified by officials of the corporation. By this purchase the steel corporation takes off the market the last large single block of ore property in the Mesaba range which is for sale. The purchase is considered very important. In all about 70,000,000 tons of ore, much of it high grade Bessemer, has been measured up and acquired, and it is estimated that even a larger yield will be obtained. The properties were purchased from the holdings of the Chemung Iron Company of Duluth.

**GOLD OUTPUT.**—The exact output of the Rand Mines in July was reported by the Johannesburg Chamber of Mines at 251,643 ounces, against 238,320 in June. Comparison with previous months and years is as follows:

|                 | Ounces. |                 | Ounces. |
|-----------------|---------|-----------------|---------|
| July, 1903..... | 251,643 | July, 1902..... | 149,179 |
| June ".....     | 238,320 | " 1901.....     | 25,959  |
| May, ".....     | 234,125 | " 1900.....     |         |
| April, ".....   | 227,871 | " 1899.....     | 456,474 |
| March, ".....   | 217,465 | " 1898.....     | 359,345 |

#### Newfoundland Iron Bounties.

Recently in the Newfoundland Legislature the Premier introduced the following regulations in relation to the working of the coal areas and iron deposits of the Colony:—The Governor-in-Council may authorise the payment of the following bounties on pig-iron, puddled into bars and steel ingots made in Newfoundland: (1) A bounty of \$1.50 per ton on pig-iron made in Newfoundland from ore, fuel, and flux, the products of the Colony. (2) A bounty of \$1.00 per ton on pig-iron made in Newfoundland from ore and flux, the products of the Colony. (3) A bounty of \$1.00 per ton on puddled iron bars manufactured from pig-iron made in Newfoundland from Newfoundland ore. (4) A bounty of \$1.00 per ton on steel billets manufactured in Newfoundland from pig-iron (made in Newfoundland from Newfoundland ore), and such other ingredients as are necessary and usual in the manufacture of steel ingots, the proportion of such ingredients to be regulated by order of the Governor-in-Council. Provided that in computing the bounty no payment shall be made with respect to foreign ores or metal produced therefrom used in the products herein mentioned.

#### THE BOSUN MINES, LIMITED.

The fourth ordinary general meeting of the shareholders of this company was held at Winchester House, London, on Wednesday July 22nd the presiding officer being Mr. E. L. Heatley, chairman of directors.

The Chairman said: Gentlemen,—The report and audited accounts of the Company for the last financial year are before you. Of the matters referred to therein, I think there are two which will mainly interest the shareholders. The first has reference to the conditions and results under which the mine is at present being worked, and the second is, as to whether the past workings show a basis on which we can judge as to what conditions would enable the mine to be worked at a profit in the future. As regards the first, in view of the difficulties under which we have been working in recent years, I think it will not be unsatisfactory to you to learn that during the year the mine has been worked at a margin of profit, although a somewhat narrow one. Having regard to this, the Board have been most anxious to consider what is the best policy to pursue in the interests of all concerned, and their views are indicated in the report. While there is a margin of profit, it is a pity not to continue operations, as, of course, further development work may open up further good ore, and it is also quite possible that better prices for the minerals may again be obtainable on the market. As you well know, from previous reports, when we originally took over this mine, the ore contents were of a higher grade than we have them at present; while at the same time, the values of minerals, lead and silver, were also higher than those now ruling. As regards the quality, we cannot help feeling that what has occurred in the past may recur in the future. There is not, perhaps, such a great diminution or difference; but every little difference tells in connection with the working costs; everything in the nature of narrow lodes

in the hard ground in which we have to work means not only that there is less ore got out of the same working but also that the cost of working on a narrow vein, as compared with a wide one, is a very much more expensive matter. As to values of our products, it is impossible to forecast, but certainly they do not seem to be getting out the same quantity of lead in Australia as they used to do, and, in the opinion of many people, it is not improbable that lead may yet again stand at a considerably higher price than it has done recently. Therefore, it is apparently desirable to have our mine in operation, in case we have a better quality or better prices ruling, so that we may be in a position to take advantage of such improvement. While we have been working recently, a new condition has indeed arisen which may somewhat help us. The Government of the Dominion of Canada have decided to grant a bonus of £3 per ton under certain conditions, which are not fully before us, to aid the British Columbia lead mines, and we are awaiting with some interest the exact particulars of the proposal which is at any rate intended to benefit the industry. No doubt this scheme has been formulated with the idea of its being a set-off against the Mining Act which was passed in favor of diminished hours of labor.

#### PARMALEE & WELD

Successors to Pohle & Parmelee

#### ANALYTICAL CHEMISTS and ASSAYERS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical processes or patents.  
General Commercial analysis.  
Prices and sample sacks free on application.

P.O. Box 1421. 1755 Arapahoe St. Denver, Colo.

#### POGSON, PELOUBET & CO.

### PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

## Sale of Valuable Zinc Mine IN CANADA

Pursuant to the order of the High Court of Justice, for the winding up of the Grand Calumet Mining Company, there will be offered for sale by Public Auction at the Local Master's Office, in the Court House, in the City of Ottawa, in the Dominion of Canada,

On the Sixth day of October, 1903,

AT 2.30 P.M.

Mining Location 30 T, in the District of Thunder Bay, in the Province of Ontario, containing 160 acres, and known as "The Zenith Zinc Mine." The property is about twelve miles from Rossport Station on the C. P. Railway. A considerable amount of development has been done, and about 2,000 tons of ore have been extracted.

The property will be offered for sale subject to a reserve bid, and to a royalty of \$3.00 per ton on all ore to be mined thereon. With it will be put up for sale, a quantity of mining plant and machinery, consisting of engine, derricks, cables, drills, carpenter's tools, blacksmith's tools, bar steel and iron, rope, saws, stoves, &c.

A detailed inventory of the chattels, an expert analysis of the ore, and any other information may be obtained from the liquidator.

Ten per cent. of the purchase money must be paid at the time of sale, and the balance in thirty days.

Dated the 13th day of June, 1903.

E. A. LARMONTH,  
Liquidator,  
48 Elgin St., Ottawa, Canada.

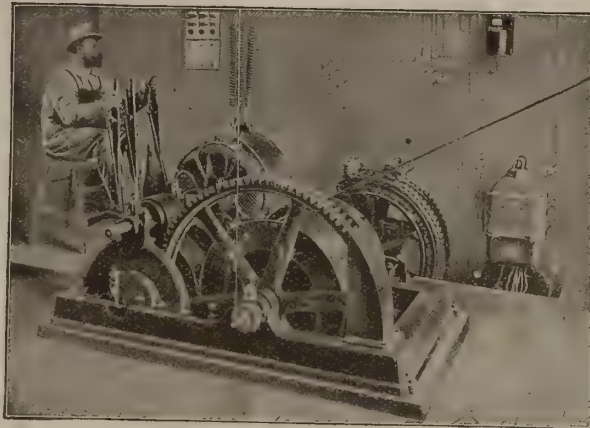
W. L. SCOTT,  
Local Master  
at Ottawa.



# Westinghouse Motors

For Alternating and Direct Current Service

Hoists, Compressors, Pumps and other mining apparatus, when driven by Westinghouse Motors, show in the point of attendance alone, a marked economy as compared with mechanical drive.



Westinghouse Induction Motor Driving a Mine Hoist.

Write for Circulars 1042 and 1050.

## Ahearn & Soper, Limited

Ottawa, Canada.

### ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

### CHROME STEEL WORKS,

BROOKLYN, N.Y., U.S.A.

F. E. CANDA, President.

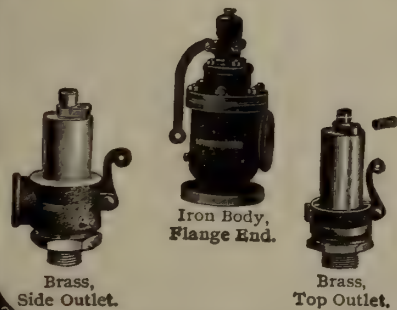
C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

### THE LUNKENHEIMER POP SAFETY VALVES

for STATIONARY, PORTABLE & MARINE STEAM BOILERS



Are made of the best materials, provided with large springs, have full relieving capacity and always prompt and reliable in operation. In brass top or angle outlet,  $\frac{3}{4}$  inch to 3 inches; in iron, brass mounted, screw or flange ends, 2 inches to 6 inches. Also furnished with nickel seats, if desired. All valves rigidly tested and inspected and warranted to satisfy. Specify *Lunkeneimer* make and order from your dealer.

Write for catalogue of Superior Brass and Iron Engineering Appliances.

THE LUNKENHEIMER CO.  
SOLE MAKERS AND PATENTEES.

Main Offices and Works,  
CINCINNATI, OHIO, U. S. A.

Branches: New York: 26 Cortlandt St.  
London: 35 Great Dover St.

### C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.  
SPECIALTIES:

Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE



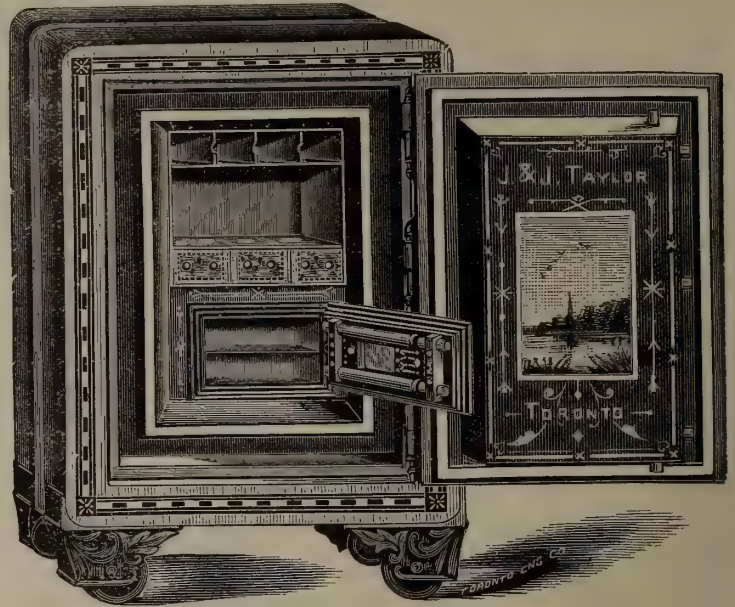
# J. & J. TAYLOR

(TORONTO SAFE WORKS)

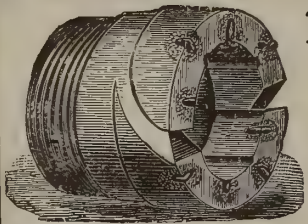
TORONTO, ONTARIO

MANUFACTURERS OF

Bankers' Steel Safes  
Fireproof Safes  
Jewellers' Safes  
Vault Doors  
Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



## LAURIE ENGINE COMPANY

MONTREAL - - CANADA

# IMPROVED

# CORLISS

# ENGINES

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

FOR ELECTRIC LIGHT and POWER PLANTS.



FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

F. E. LEUSHNER,

Room 12, Janes Bld., TORONTO, Canada.

**A. LESCHEN & SONS ROPE CO.**  
920-922 N. 1<sup>ST</sup> STR. ST. LOUIS, MO.

BRANCH OFFICES: { 92 Centre St., • NEW YORK, N. Y.  
137 East Lake St., • CHICAGO, ILL.  
85 Fremont St., SAN FRANCISCO, CAL.

**WIRE ROPE & AERIAL WIRE ROPE TRAMWAYS**



TRAM AT THE SILVER MINE, TELLURIDE, COLO.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO., 52 Broadway, New York**

Manufacturing Agents for Canada, ROBERT GARDNER & SON, Montreal, P.Q.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

**4 TRAINS DAILY 4**  
EXCEPT SUNDAY

And Sunday Train Both Directions  
PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

**E. J. CHAMBERLIN,**  
General Manager.

**C. J. SMITH,**  
Gen. Traffic Manager.

**W. P. HINTON,**  
Gen'l Passenger Agent.

**J. E. WALSH,**  
Ass. Gen. Passenger Agt.

## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

**60% PER ANNUM GUARANTEED**  
California-Nevada Mining Co.

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT A 200-TON PER DAY PLANT  
READY FOR THE MILL, and the CONTRACTED FOR and will be  
Hoodlum Claim, which adjoins the in full operation not later than  
Old Victor Mine, yet to figure on. April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.

Do not fail to investigate this proposition, for the more you investigate the more stock you will want. Write for prospectus.

**W. H. BALDWIN & CO., Brokers and Financial Agents** 49-50-51-52 VOLCKERT BLDG., ALBANY, N. Y.  
REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company, Los Angeles, Cal.; any mining journal of the state or prominent mining men.



## Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

- (A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.
- (B) The establishment of a central reference library and a headquarters for the purpose of this organisation.
- (C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.
- (D) To encourage and promote these industries by all lawful and honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

### SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

### PUBLICATIONS.

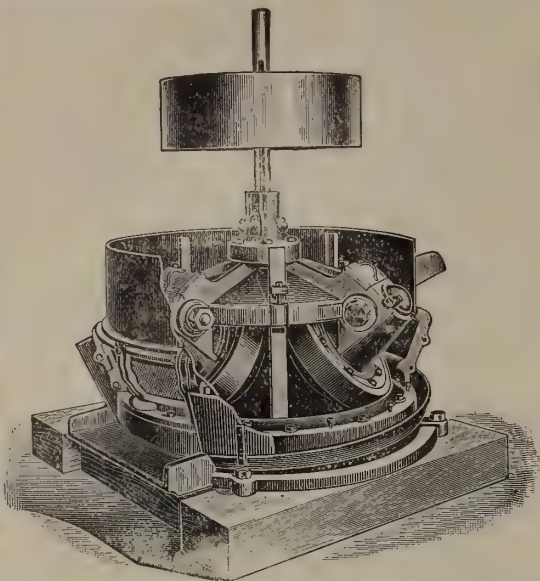
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

**B. T. A. BELL, Secretary,**  
Orme's Hall, Ottawa.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

# WIRE ROPE

We carry a Large Stock.

**W. H. C. MUSSEN  
& CO.**

MONTREAL.

Obtain our Prices.

# MINE RAILS

## Cable Hoist-Conveyors



Laurent-Cherry Patent  
Cable Hoist-Conveyor,  
Morgan Falls, Ga.

MANUFACTURED BY  
**THE TRENTON IRON CO.**  
TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.  
Also, Wire Rope Equipments for Surface and Underground Haulage.  
Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining  
Association of Quebec.

Vol. I Ontario Mining Institute.

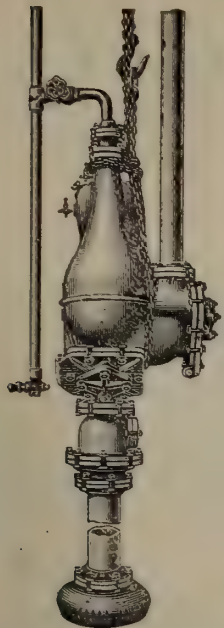
Vols. I, II and III Federated  
Canadian Mining Institute.

Vols. I, II, III and IV Canadian  
Mining Institute.

**\$20** WILL be paid for a complete  
set of these volumes. Readers  
having any, or all, of these copies for  
sale please write to

**The Canadian Mining Review**  
OTTAWA, Canada.





# The Pulsometer.

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

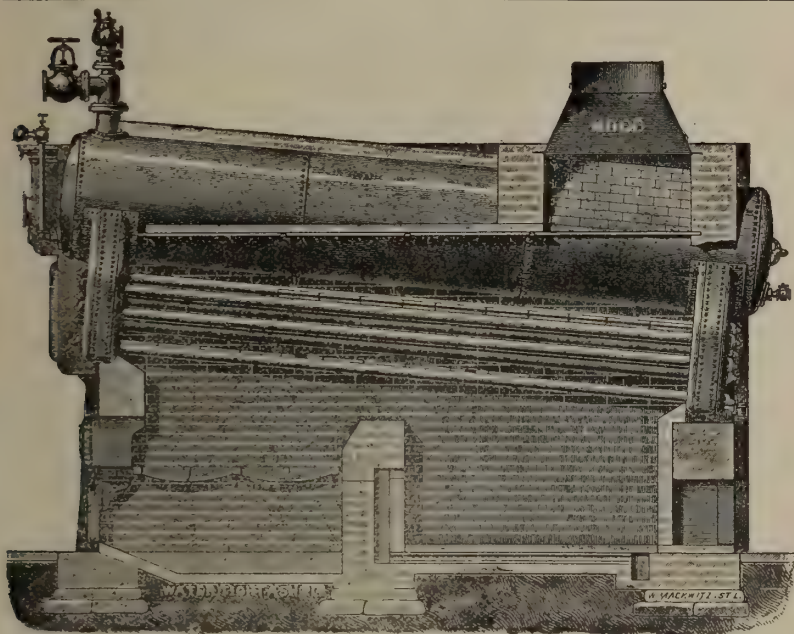
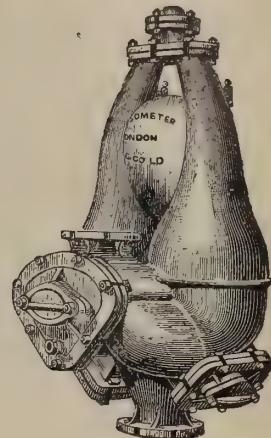
**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

NOISELESS. NOT AFFECTED BY WEATHER.  
NO SKILLED LABOR REQUIRED.  
MOST ECONOMICAL AND BEST MADE.  
NO EXHAUST STEAM. SIMPLE. DURABLE.

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL

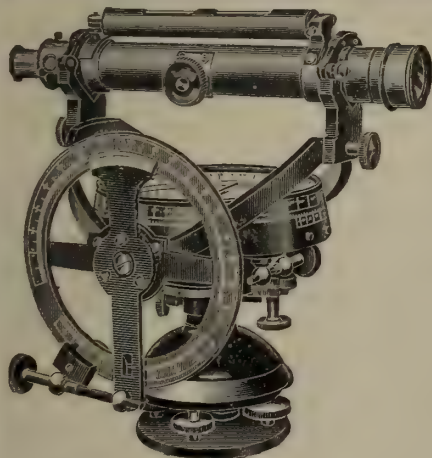


## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

**Head Office : 107 ST. JAMES STREET, MONTREAL**

Address : P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\*; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction or 100; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite ; copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

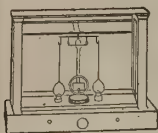
**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.



## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals

Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

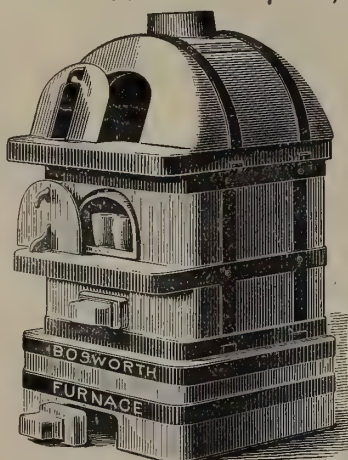
CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## THE DENVER FIRE CLAY CO.

1742-1746 Champa St., DENVER, COLORADO, U.S.A.



### ASSAYERS and CHEMISTS SUPPLIES.

MANUFACTURERS OF

**Furnaces, Crucibles,  
Scorifiers, Muffles,**

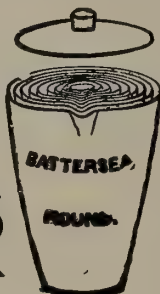
and all kinds of Fire Clay goods for  
metallurgical purposes. Also Bone  
Ash, Borax Glass, and strictly C.P.  
Granulated Lead.

SELLING AGENTS FOR

**AINSWORTH BALANCES.**

WRITE FOR CATALOGUE.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

### COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

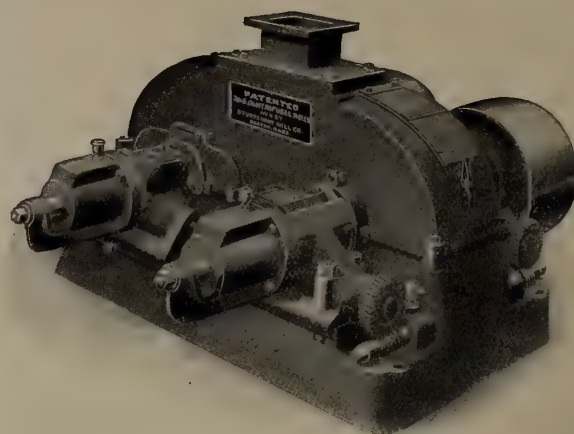
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.

## Centrifugal Crushing Rolls



### TIRES CUSHIONED BY SPRINGS



PATENTED



Common Rolls are to spring-tired Centrifugals what the Dump Cart is to an up-to-date Rubber-tired carriage. Spring-pressed tires absorb crushing shocks. A cart, shaky enough at a walk, can scarcely hold together going faster on a road easy for a modern carriage.

If you are interested in a Roll constructed to LAST and turn out the largest product at the smallest expense, write for our catalogue of

### CRUSHING, GRINDING and SCREENING MACHINERY.

## STURTEVANT MILL CO.

BOSTON, MASS.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.  
Wire specially selected for own exclusive use.  
We have made many records with our Winding, Haulage and Crane Ropes.

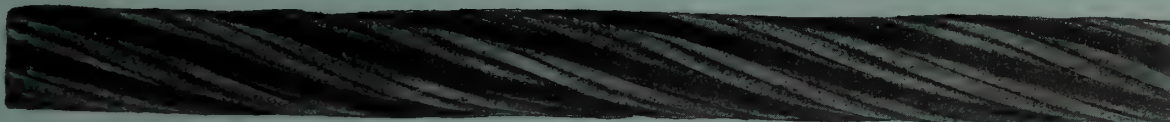


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA :

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

**IRON, STEEL and GENERAL METAL MERCHANTS**

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Stear Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices : **CANADA LIFE BUILDING - MONTREAL.**

## Montreal Pipe Foundry Co. Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

# PIPE

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES :

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at : RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

**CANADA LIFE BUILDING, MONTREAL.**

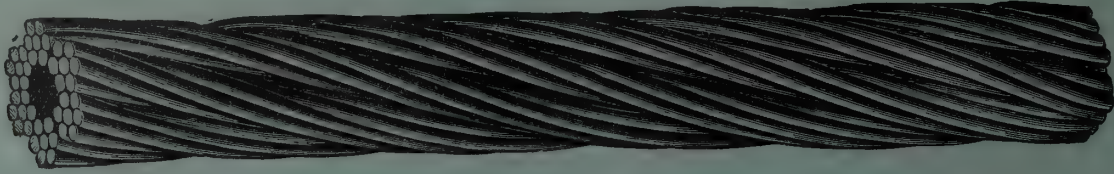
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

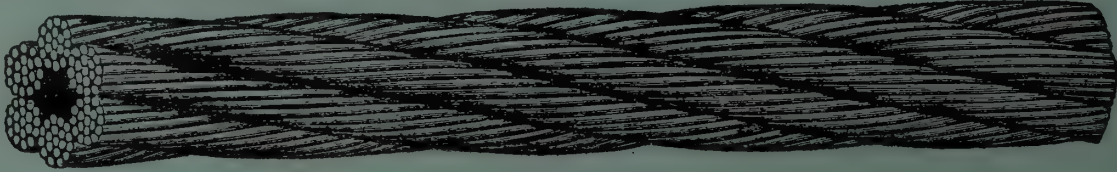
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS . . .

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard  
IMMEDIATE SHIPMENT.

LIGHT MINING RAILS  
12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard  
..IN STOCK..

**COOPER**

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...

CATALOGUE  
ON  
APPLICATION

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. IX.

OTTAWA, SEPTEMBER 30th, 1903.

Vol. XXII—No. IX.



**AIR  
COMPRESSORS  
GAS**

**THE CANADIAN RAND DRILL CO.**  
**SHERBROOKE, QUE.**  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



**ROCK  
DRILLS**



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

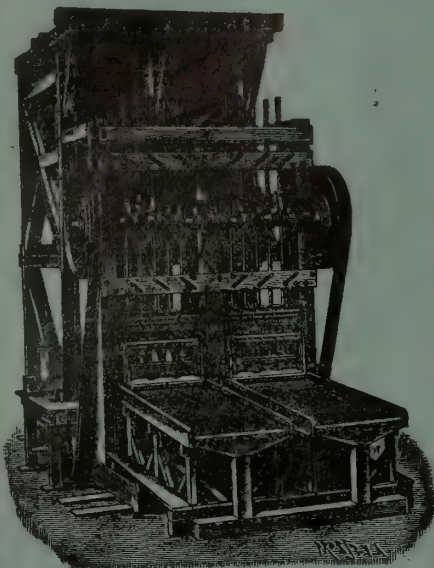
ROSSLAND, P.O. Building.



# FRIED. KRUPP AKTIENGESellschaft GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 540, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West

Opposite Queen's Hotel

TORONTO, ONT.

## MINING EQUIPMENT, Etc.

# The Wm. Hamilton Mfg. Co. Limited

PETERBOROUGH, ONT.

BUILDERS OF

## *The Samson Turbine*

Upright and horizontal. For all heads.  
Especially adapted to driving

## MINING and ELECTRIC POWER PLANTS

Unequalled for power, speed, efficiency and regulation.

We also manufacture the Cascade wheel, for high heads;  
and are builders of a complete line of mining machinery.

Write for our Catalogues.

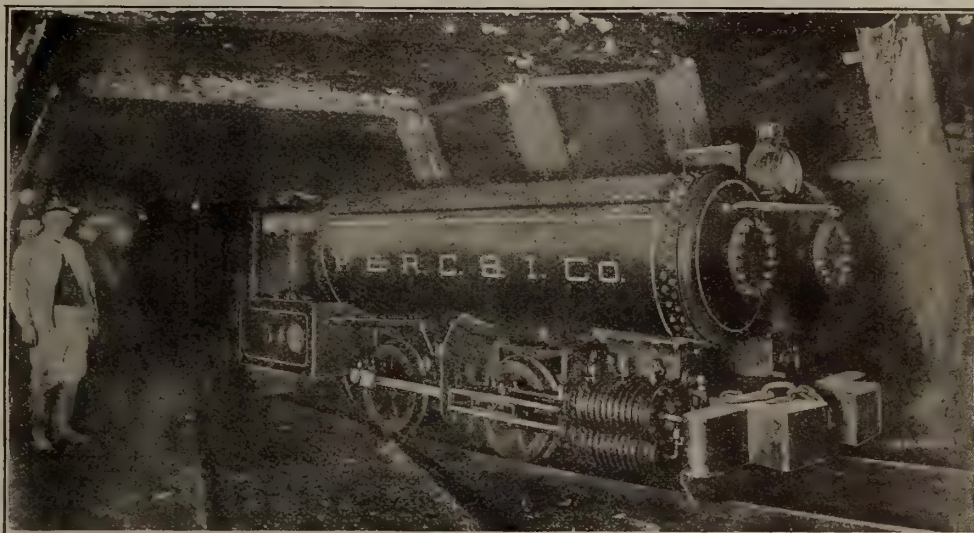




# Baldwin Locomotive Works

Burnham, Williams & Co., Philadelphia, Pa., U. S. A

Steam  
Compressed Air  
and  
Electric



Baldwin Compressed Air Mine Locomotive

Locomotives FOR Mines and Furnaces

HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

PEACOCK BROTHERS, Canada Life Building, MONTREAL.

THOS. FIRTH & SONS, Ltd., Sheffield,  
Tool Steel and Rock Drill Steel

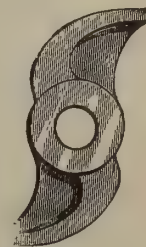
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



H. W. DeCOURTENAY & CO.

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.

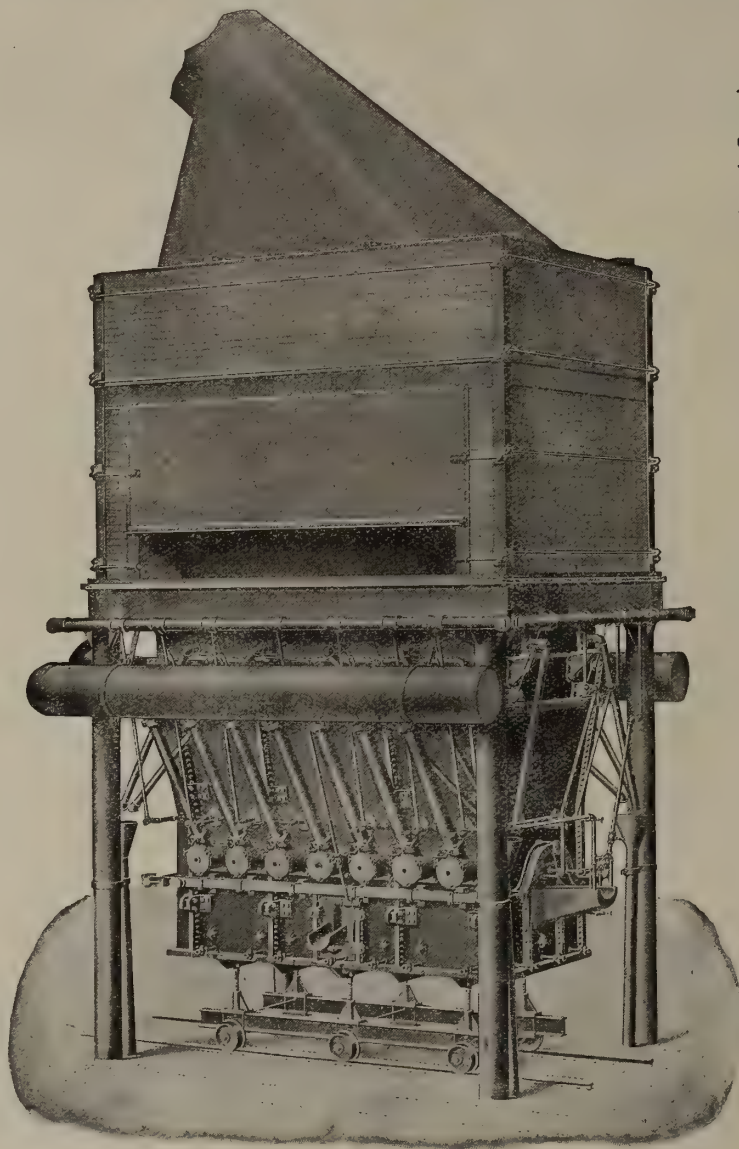


# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'FG CO.,  
SCRANTON, PA.

## WE ARE EXTENSIVE BUILDERS OF SMELTING MACHINERY



We illustrate herewith a 42 inch by 120 inch steel water jacketed copper smelting furnace which embodies all the latest improvements in copper smelting.

This furnace was built by us for the Tyee Copper Company, Ladysmith, B. C. It has extraordinarily large capacity, and is giving excellent satisfaction.

We have the largest and best equipped shops in the world devoted to the manufacture of copper and lead smelting plants.

We build copper and lead smelting plants, copper converters, water jackets, hydraulic accumulators, hydraulic cars, slag pots, etc.

SOLE BUILDERS OF  
**REYNOLDS  
BLOWING ENGINES**  
FOR ALL  
METALLURGICAL PURPOSES

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

### GENERAL

## CHICAGO,

LONDON, ENG., 533 Salisbury House



### OFFICE

## ILL., U.S.A.

JOHANNESBURG, South Africa

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

SUCCESSOR TO

BUILDERS OF

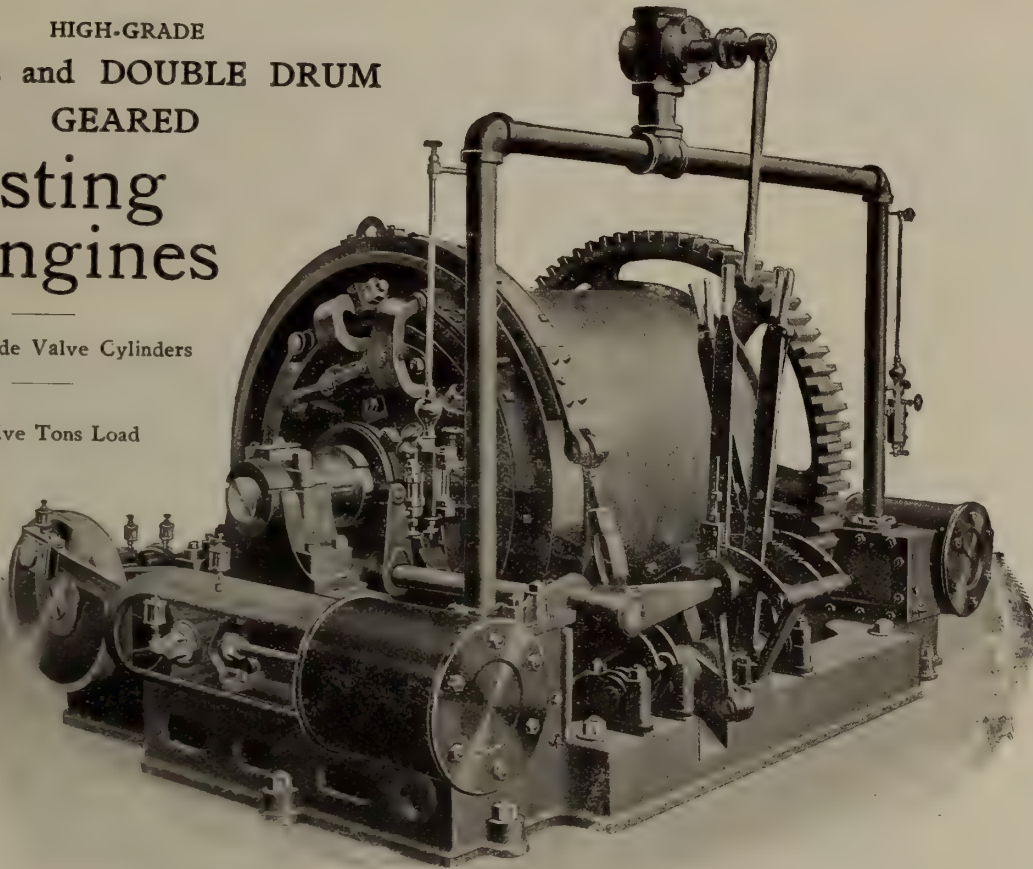
## MINING MACHINERY

HIGH-GRADE  
SINGLE and DOUBLE DRUM  
GEARED

### Hoisting Engines

Duplex Slide Valve Cylinders

Capacity:  
One to Five Tons Load



SINGLE DRUM GEARED HOISTING ENGINE

The clutch, which is of the band friction type, consists of a steel band lined with soft wood blocks, and is tightened around a ring on the drum head. This is the only satisfactory friction clutch for hoisting work.

These hoisting engines are complete with brake, bed-plate, steam pipe, throttle valve, oilers, wrenches, packing and foundation bolts and drawings.

Immediate delivery for smaller sizes of single drum reversing engines.

WE ARE THE MOST EXTENSIVE MANUFACTURERS OF LARGE GEARED  
AND DIRECT-ACTING HOISTING ENGINES

#### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

#### GENERAL

CHICAGO,



#### OFFICE

ILL., U.S.A.

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

#### BRANCH OFFICES:

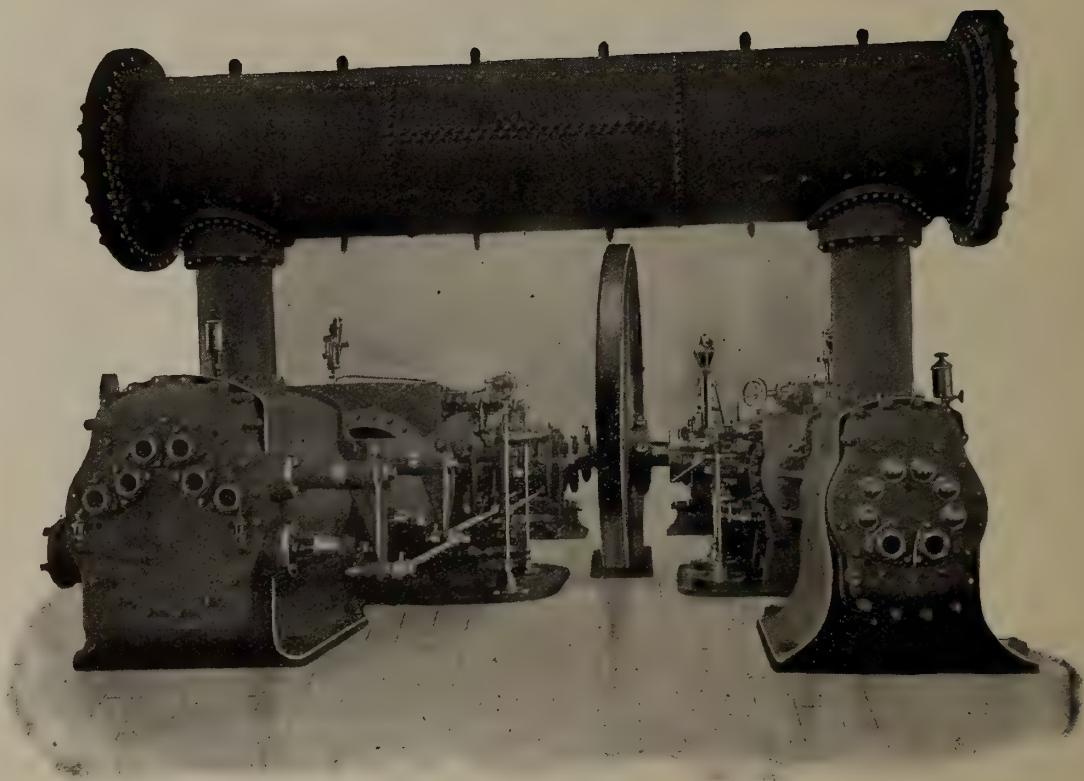
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RATPORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

MECHANICS SUPPLY CO., Quebec.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-  
ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.

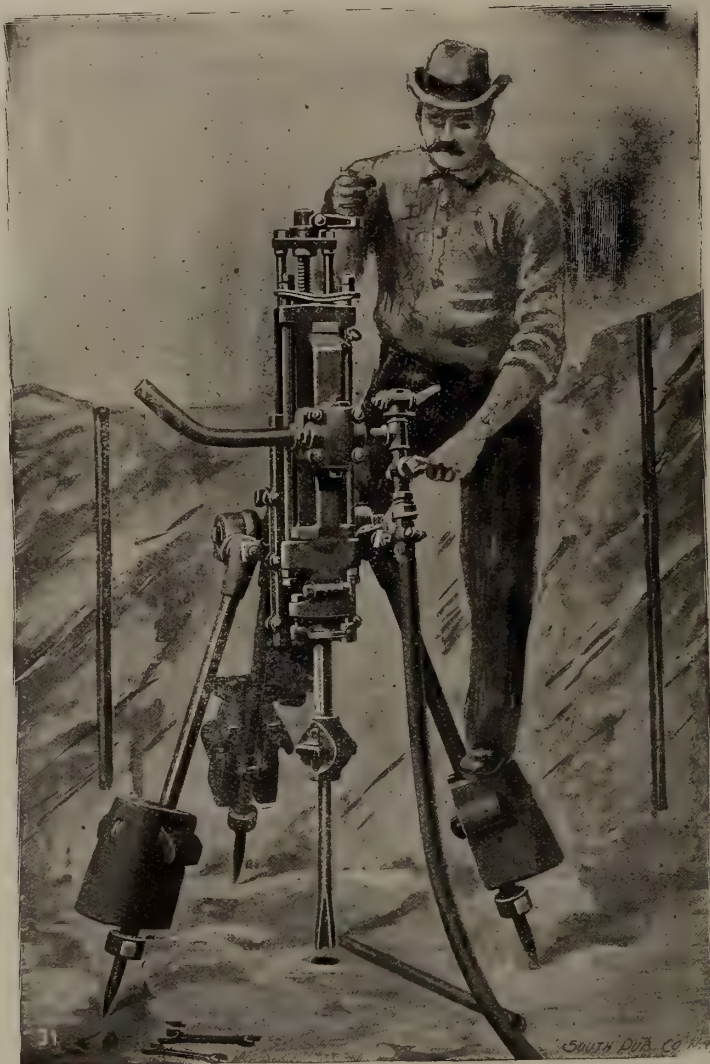


# INGERSOLL-SERGEANT

## MACHINERY

### Rock Drills

Unexcelled for work and  
owing to construction  
the economy in repairs  
will save first cost . . . .



### Air Compressors

In all styles to meet the  
requirements of any duties.

MADE IN CANADA.

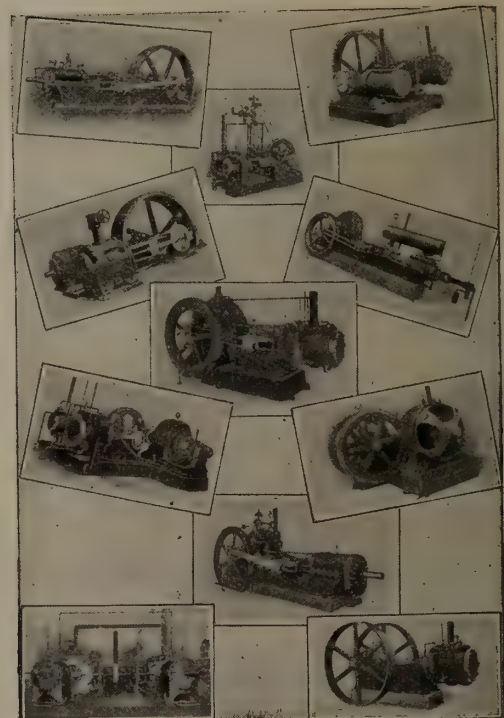
**THE JAMES COOPER MANFG. CO. LIMITED**

299 St. James Street  
MONTREAL.

BRANCHES—Halifax, N.S.

Rat Portage, Ont.

Rossland, B.C.



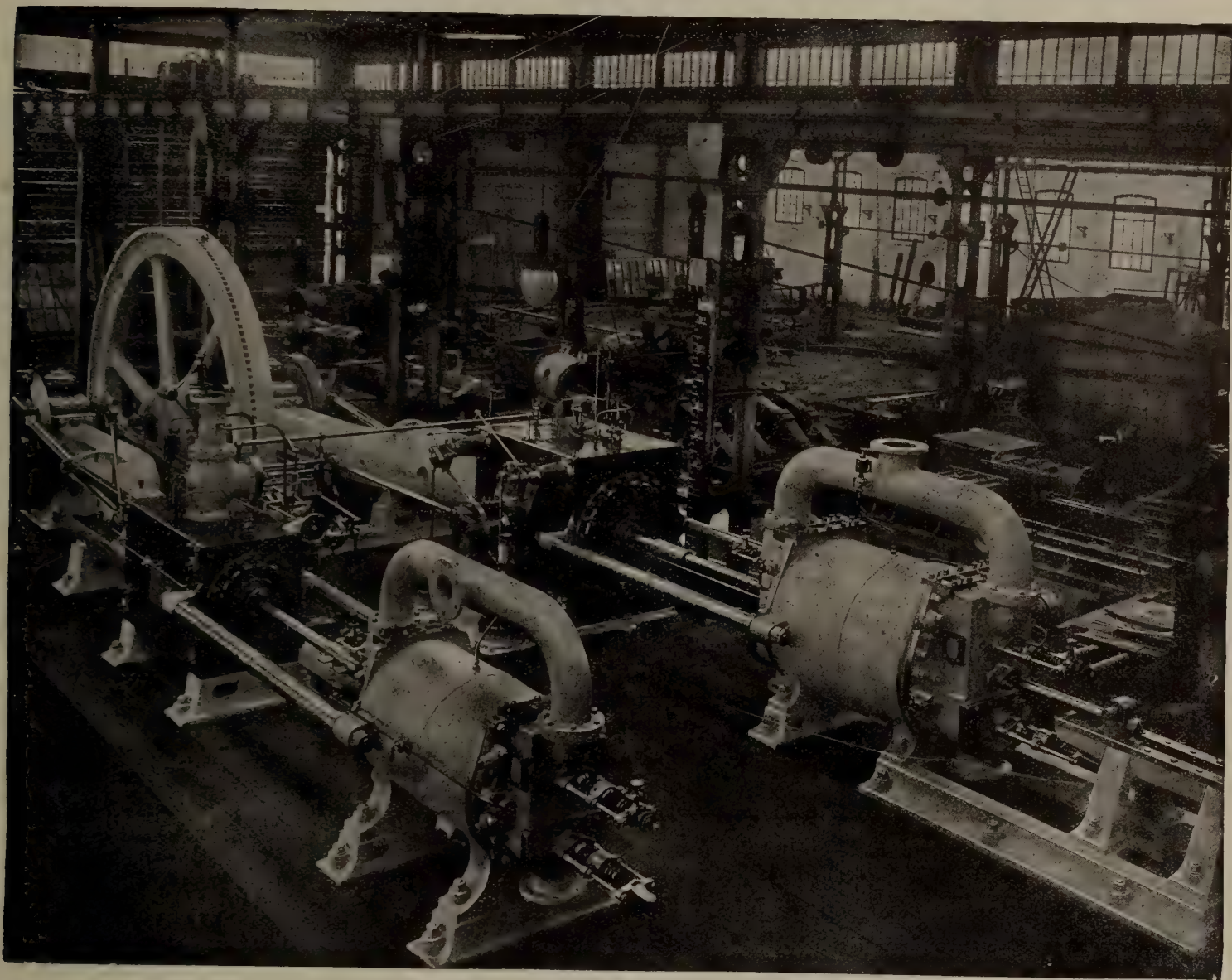


# WALKER BROTHERS

## WIGAN, ENGLAND

# AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRs,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

PEACOCK BROTHERS Representatives for Canada . . . 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

.....WORKING MACHINERY

.....FOR.....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

## J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

## CARBONS (BLACK DIAMONDS) AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

1644 MONADNOCK BLOCK, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASGOW, N.S.



# DIAMOND

## DEEP DRILLING

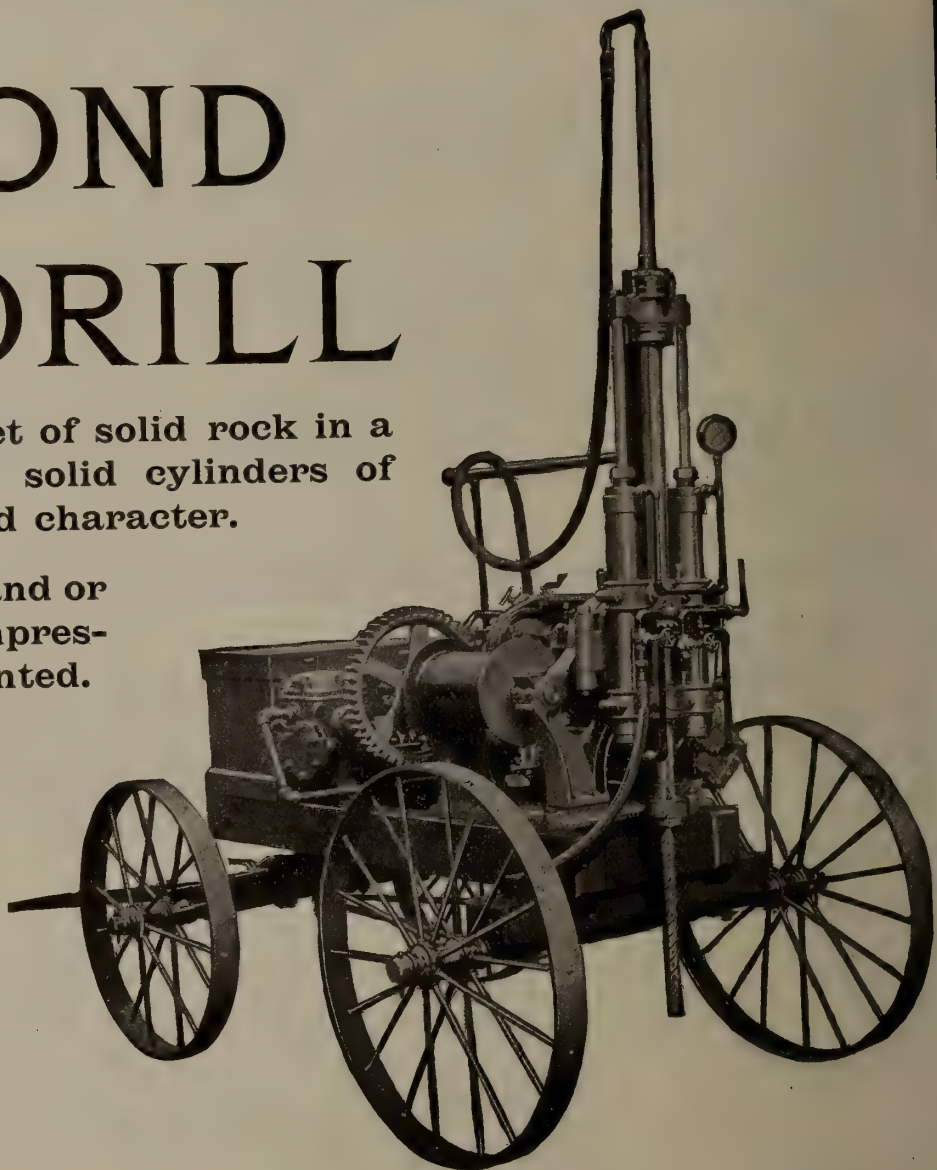
makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# Sullivan Straight Line Two Stage Compressors.

Simple.

Efficient.

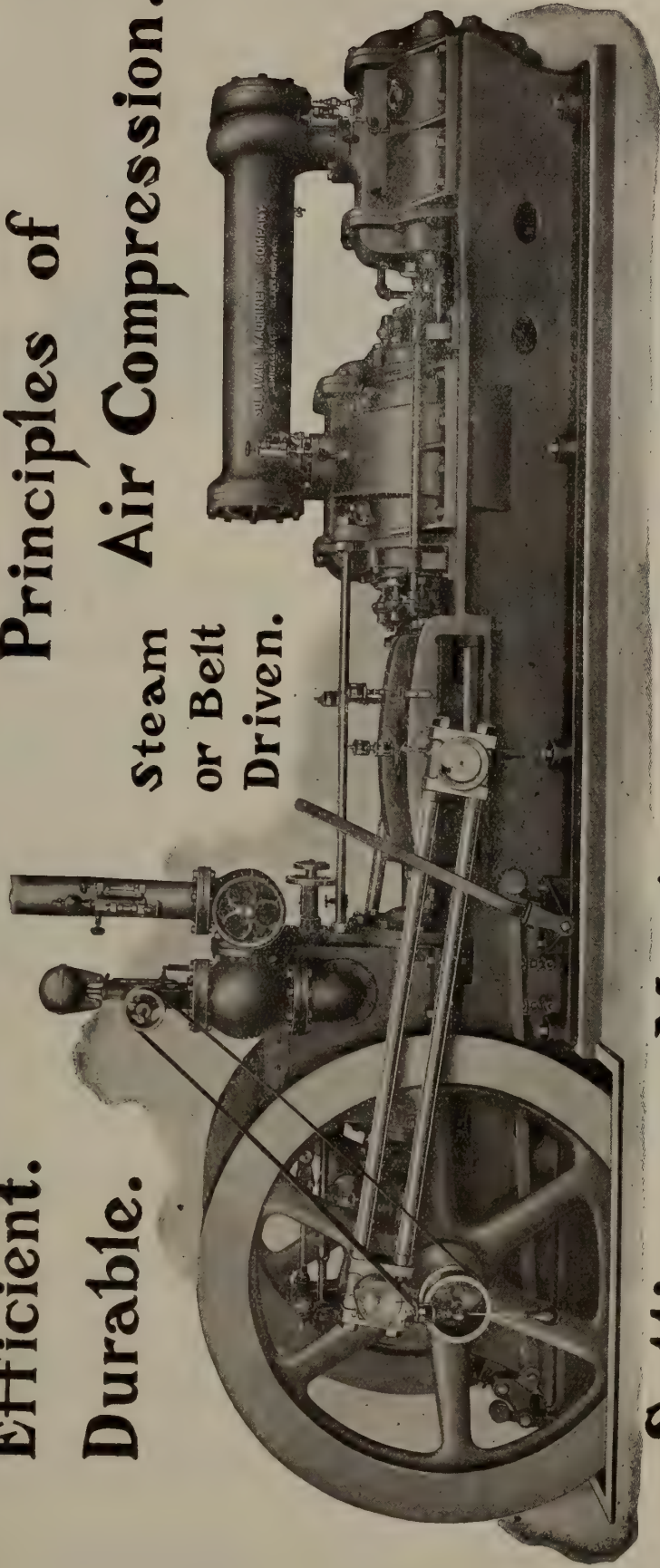
Durable.

Embody the Best

Principles of

Air Compression.

Steam  
or Belt  
Driven.



**Sullivan**

**Machinery**

**Company.**

Claremont, N.H.  
New York.  
Pittsburg, Pa.

135 Adams St.

Chicago, Ill., U.S.A.

European Agency 25 Rue Raffet, Paris

St. Louis, Mo.  
Denver, Colo.  
El Paso, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.

**Head Office : MONTREAL, Que.**

**JAS. P. CLEGHORN,**  
 President.

**CHARLES FERGIE,**  
 Vice-Pres. & General Manager.

**D. FORBES ANGUS,**  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### MINERS OF

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

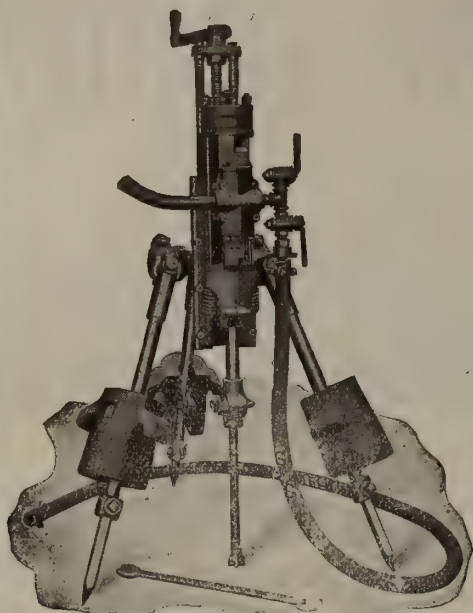
M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.



# JEFFREY Coal Cutting Hauling Drilling Screening Crushing Dredging Elevating Conveying Power Transmission Coal Washing MACHINERY



BEST ROCK DRILL IN THE  
MARKET

Catalogue No. 72

Elevating-Conveying  
Machinery

May we send you a copy?

## COAL CUTTERS

### ELECTRIC MINE LOCOMOTIVES

Catalogue No. 19 describing  
these is yours for the asking



We can elevate or convey your  
material—bulk or package, wet  
or dry, up, down, straight along,  
sidewise, any size, any distance



JEFFREY 16A ELECTRIC CHAIN COAL CUTTER.

— ADDRESS —

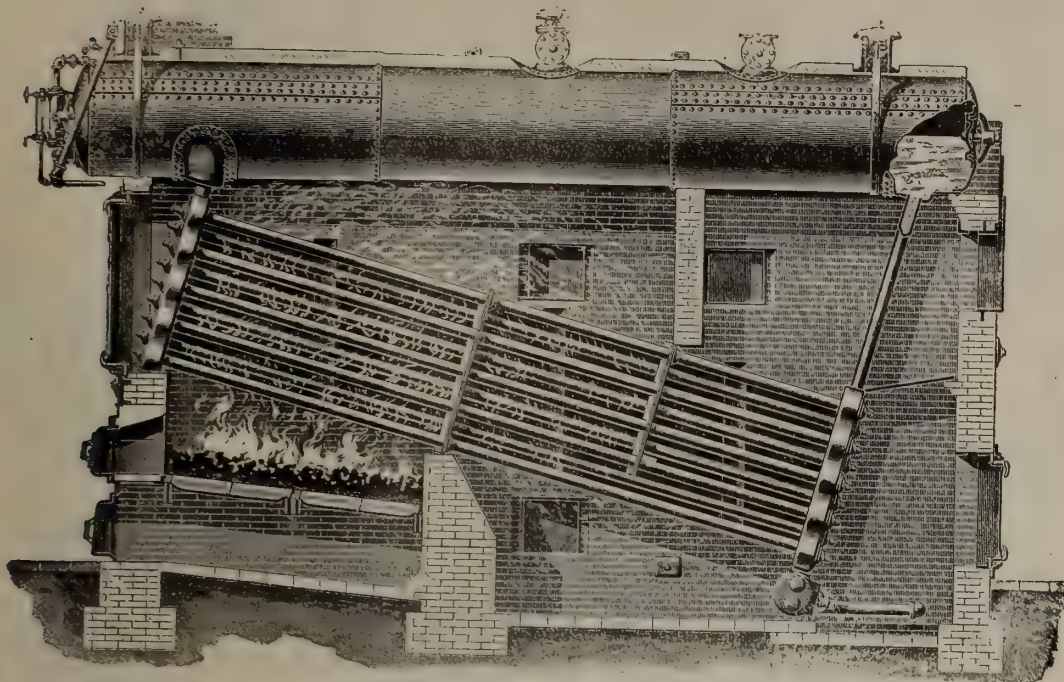
## THE JEFFREY MFG. CO., Columbus, Ohio, U.S.A.

Montreal Representatives—WILLIAMS & WATSON

Toronto Representatives—A. R. WILLIAMS MACHINERY CO.



# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY  
GEARS, PULLEYS, HANGERS  
IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company



# Electric Blasting Apparatus.



Adapted for Firing all kinds of Explosives used in Blasting.

Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.



MANUFACTURED  
ONLY BY

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

SEND FOR  
CATALOGUE

## Hamilton Powder Company

Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

# DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

### ONTARIO POWDER CO. Limited

176 ONTARIO STREET

Kingston, Ont.

### Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

### ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

## Dominion Bridge Co., Ltd.,

Montreal and  
Lachine Locks, P.Q.

# MILL AND MINING MACHINERY

Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, Steam

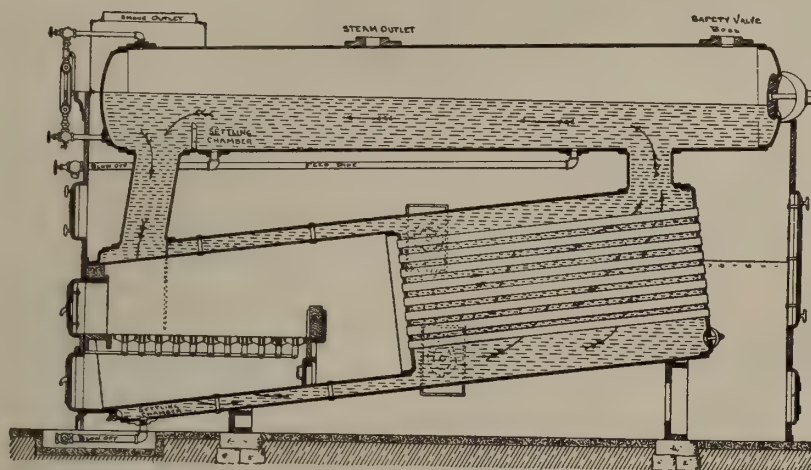
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron

Castings of Every Description. Light and Heavy Forgings.

## ALEX. FLECK Vulcan Iron Works. OTTAWA



## Combines the Best Qualities of Other Boilers.



The Mumford Standard internally fired boiler combines to a remarkable extent the best features of the Scotch and English types of internally fired boilers, together with the lighter weight, less floor space and more perfect circulation of the best boilers of the American water tube type.

The construction throughout, except the tube sheets, is cylindrical and spherical, requiring no stays; the boiler is supplied with an outer steel casing or for brick setting as desired by the customer.

The steam and water space is divided between two cylindrical shells; the thickness of plate is not so great as in the Scotch marine type, and the expensive and troublesome rear combustion chamber is avoided.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**AGENTS :** WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.

2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN  
GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

#### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

#### GROUP III.

- (h) Biology and Public Health.

3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
Sept. 30th, 1903.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

## 1903

THIRTEENTH  
YEAR

BY

### B. T. A. BELL

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

This standard work of reference to Canadian Mining under-  
taking and active industries is

**NOW READY**

## **A COMPLETE MINING DIRECTORY**

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces

For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

A Complete  
Directory  
to all  
Canadian  
Collieries

Blast Furnaces

Mines

Quarries

Mills

Smelters

and

Mineral

Producers

Endorsed

by the

Canadian

Mining

Profession

Authentic  
Information  
Concerning  
their  
History  
Organization

Capital

Dividends

Accounts

Operations

Statistics

Plants

Labour

Approved

by the

Mining

Financial

Press

**Subscribe  
for it.**

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

**Advertise  
in it.**



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

LOBNITZ & CO., LIMITED,  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGN.  
**GOLD DREDGERS.**  
ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., LTD., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW Al Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

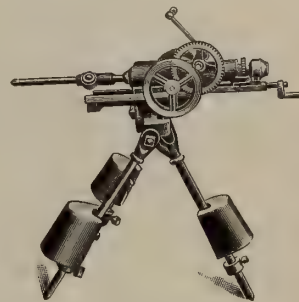
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.

This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



# THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

## STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather  
MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.

Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE

DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
**Canadian Copper  
Company**

74 BROADWAY  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,

Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and  
Minerals

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

**GEO. G. BLACKWELL, SONS & CO. LTD.**  
THE ALBANY, LIVERPOOL, ENG.

## LEDOUX & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

**McPherson, Clark, Campbell & Jarvis**  
Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building  
16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### PARMALEE & WELD

Successors to Pohle & Parmelee

**ANALYTICAL CHEMISTS and ASSAYERS.**

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical processes or patents.  
General Commercial analysis.  
Prices and sample sacks free on application.

P.O. Box 1421. 1755 Arapahoe St. Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to  
538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel      Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc. (McGill)**

CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street      MONTREAL

**ASSAYS OF ORES.**CHEMICAL AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,

MONTREAL.

Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway

NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.

8-KING STREET-8

MANCHESTER, ENGLAND.

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation.      Reports.      Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.

Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation.      Reports.      Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

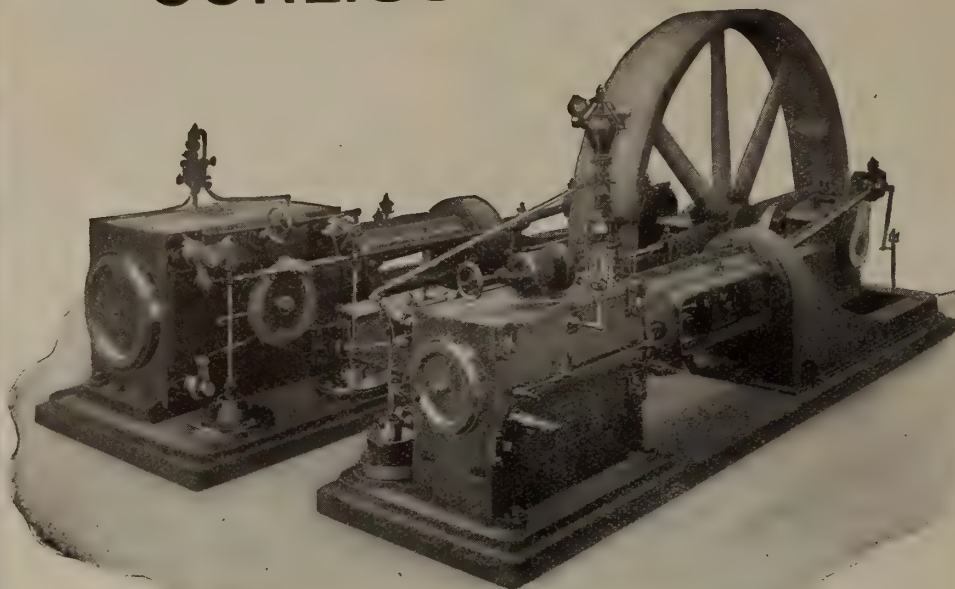
GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

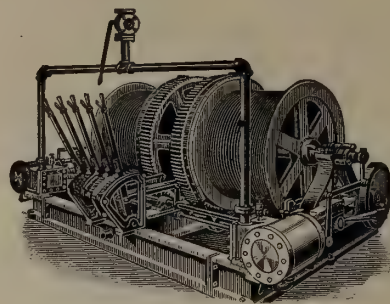
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels for Dredging, Dykeing, Ditching, GOLD MINING, Etc., of various Styles and Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES, HORSE POWER HOISTERS, SUSPENSION CABLEWAYS, STONE DERRICKS, GANG STONE SAWS, Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works, Pumping Sand, Gold Mining, Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# Wire Screens

FOR EVERY CLASS OF MATERIAL.

Perforated Metal of Steel, Copper, Brass, Zinc, for all purposes.

Special attention given to Miners' Requirements

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.

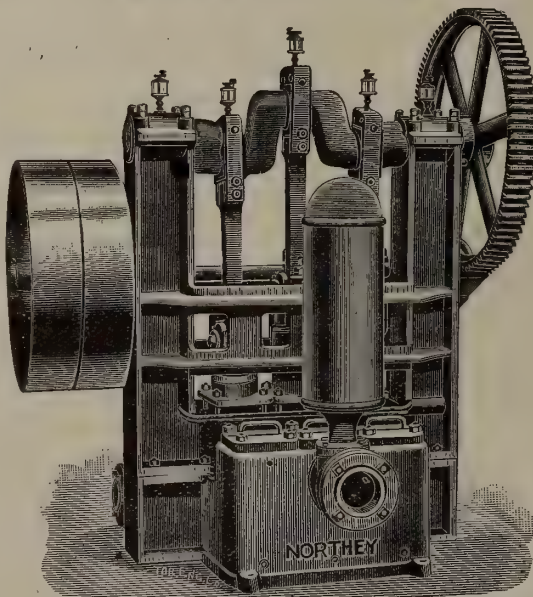
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**





# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN  
THE DOMINION OF CANADA.

**B. T. A. BELL,** Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 9.

SEPTEMBER, 1903.

VOL. XXII., No. 9.

## Dominion Steel Company And Dominion Coal Company.

After three months investigating the affairs of this Company by Mr. J. H. Plummer, Ex-Assistant General Manager of the Canadian Bank of Commerce, who must be regarded as a financial expert, a scheme has finally been resolved which, whilst not meeting with the entire approbation of all parties concerned is regarded as a *via media*, and the consummation of which will result in the complete severance of these concerns. Whether the effect of the operation will be the same as in the case of the Siamese Twins, and result in the death of one or the other, remains to be seen. Our own view is that whilst the severance may have been rendered necessary by the development of untoward circumstances it is on every ground unnatural and regrettable. Unnatural, because properly managed the interests of the two concerns dovetail to such an extent that the management could be more economical and more affective under one control than under two. Regrettable, because the severance puts an end to an alliance which had been looked forward to for many years, and which in the opinion of competent experts promised to be productive of prosperity and wealth.

It is not necessary to dilate upon the intrinsic value of the coal Company's property. It is undoubtedly one of the finest properties of the kind on the continent or, indeed, in the world, and nothing but the most incompetent handling could prevent it becoming a commercial success. The one thing which limited its capacity in this direction until a few years ago was the absence of a local market. This combined with the fickleness of the demand from the United States sometimes left the concern so short of trade as seriously to cripple its economical management. The establishment of the Steel Company supplied this local deficiency, and guaranteed such a large consumption as to place the Coal Company beyond the influences above mentioned, and ensured at all times an output which would yield a working profit. Given the two conditions which exist, first a valuable coal property with unlimited supplies of fuel of a suitable character for the manufacture of steel, and added to this a modern steel works properly equipped, and furnished with its own natural ore supply, nothing but competent management was required to bring out from this happy combination a permanent industry which would have been a source of wealth not only to the shareholders but to the country at large. Nothing has occurred to affect the value of the coal or ore deposits. These are just what they were before the Steel Company came into existence. But whilst nature has done so much, man seems to have done his utmost to discount the value and prevent the gathering of the

harvest which investors had every right to expect. It is now admitted that whilst the steel plant is modern and in many respects efficient, there has been a reckless squandering of capital, and according to the highest authority the whole works could be reproduced for two-thirds of what they have cost. In other words, in connection with the institution and development of this industry there has been a waste of at least \$7,000,000 to \$8,000,000. Just what the position of the Steel Company would be today if they had this amount in cash one can better imagine than describe. It would at least wipe out every cent of their indebtedness, give them sufficient to complete their plant, and still leave a respectable margin for other purposes. It is wonderful to think that after five years work and the expenditure of \$25,000,000 to \$30,000,000 the plant is still deficient in several important respects; has still to construct mills for wire rods, structural steel, a large battery of coking ovens, and an extensive coal washing plant. It is more difficult to understand how such a disastrous result can have been attained, when one remembers that since the leasing of the Coal Company's property a year ago the whole of the fuel consumed in the Steel Works has been supplied at less than cost. One of the highest authorities in England, if not indeed the highest, who visited Canada in the early part of last year, and went through the Sydney works, stated to the writer that his firm was prepared to enter into negotiations for purchasing outright or securing a controlling interest in the Dominion Steel Company, but that the cost of the plant had been so outrageous that it would be quite impossible for them to come to terms, and on that account the negotiations were dropped at a very early stage. This opinion has been confirmed by other men of high standing, which justifies the verdict that from the time of Mr. Moxham's visionary and crude ideas of cost, when he estimated the production of pig iron at \$5 a ton instead of \$11, everything has proceeded on a similarly incorrect basis. This is not because the Company has not employed competent experts, but if in face of such a gigantic failure in which the reputations of several of the greatest financiers in Canada have suffered we may be permitted to offer an explanation, we would attribute it to the fact that those experts have worked under the control of a board which did not include one director having a practical acquaintance with the business which he undertook to direct; and when one considers the high character, and even the remarkable achievements of several of these men in the realms of finance and public life, it becomes still more obvious that such experience does not equip men to control and direct a highly technical industrial enterprise. It would have been easy, at the time of Mr. Moxham's original estimates to have submitted them to other tests, for it is well known



that no sooner were his figures published than there was a general condemnation of their optimism on the part of practical men all over the continent. Many of these protests reached the ears of the directors, but were disregarded, and now that disaster and almost disgrace has overtaken one of the most promising concerns ever launched in Canada, one can not altogether acquit the board of directors of responsibility in the matter.

In addition to the failure of the chief executive body properly to control and direct the expert knowledge which was at their disposal, they incidentally failed to ascertain in the earlier stages of their history just what class of steel could be made from their ore, which accounts for a change of programme, the abandonment of some mills and the purchase of others. It has always been manifest that the Company did not possess a Bessemer ore, and it is well that they are now directing their attention exclusively to the production of a different class of steel.

Whether the severance of the two concerns will enable the Steel Company to rally and make a success, depends upon conditions which will very soon develop. The first is that in addition to the substantial sum of \$2,635,000 which they are to receive from the Coal Company, they will be able to raise a sufficient amount of cash to pay off other liabilities, and to complete their plant. For this purpose it is understood that the directors have guaranteed to find the money for \$1,500,000 in bonds. In our judgment this amount is totally inadequate, as according to the last published balance sheet the liabilities, after deducting available cash assets, were about equal to the amount now to be received from the Coal Company, which would only leave \$1,500,000 for other purposes. According to the best advice we learn that it will take \$3,000,000 at least to do what is necessary, and an attempt to do it at less will result either in inefficient plant or an increase in the indebtedness of the Company. The other condition which must obviously be attained without a moment's delay is the securing of efficient and competent control. The Company have evidenced their appreciation of this fact by the recent additions to the board, and in the person of Mr. W. MacMaster it has undoubtedly been strengthened, as he has had many years experience in a branch of the iron trade; but with all respect to the gentlemen who now constitute the board, we consider that it would be of the highest value if they could add one or two others who have been directly interested in the manufacture of steel. We know of no industrial enterprise which is not well represented on its board by men of practical experience in its own line, and in so highly technical and costly an industry as the one under consideration, it is absolutely indispensable.

Turning for a moment to coal, we can not disguise the fact that the future of this enterprise is to some extent under a cloud. Undoubtedly the reason why the lease has been broken and a severance effected is to be found in the difficulty of reconciling conflicting financial interests, and one must agree that whilst Mr. Ross's reputation suffered somewhat in his handling of steel, he has fairly rehabilitated it in the successful manner in which he has enabled the coal interests to emerge from the conflict. No sooner did he find that coal was wedded to a concern which in the present was unprofitable, and the future of which was extremely doubtful than he set about to effect a divorce, and has at last succeeded in doing so by an actual sacrifice of \$1,100,000, which may be considered cheap alimony. The bone of contention which made a settlement so difficult and delayed it so long was the contract for fuel by which the Steel Company were to get the whole of their requirements for a practically unlimited time at \$1.20 a ton. In every light we consider this contract just as foolish as the one made by the Dominion Coal Company seven years ago with the Everett Gas Company. Both contracts were made at a time when wages were low

and the cost of production at its minimum, and the first inflation of trade made the contract a losing one. It is a matter of history that on the failure of the Everett Gas Company the former contract was broken. The present one, however, is of a different character in this respect, that it is more indispensable to the Coal Company, since it furnishes a local demand for a million tons of coal a year, and takes the bulk of the fine or slack which is produced. Mr. Ross has not been able in any way to break this contract, but he has been able to secure such a modification of the terms as will limit the supply of coal at contract prices to something approximating to the present consumption of the Steel Works, and has also secured the option of furnishing fine instead of round coal, in four years hence when the Steel Company will have completed their coking plant. This provision is no disadvantage to the Steel Company, because by that time they will require to coke most of their fuel, and will be in a position to do it, and it is an advantage to the Coal Company in finding a ready market for slack which in bad times of trade becomes a drug. The contract is still, however, a white elephant—or worse; since the present cost of production is \$1.35, which makes it extremely doubtful whether such a reduction in cost can be effected as to leave a small margin of profit on the contract, and if not, the liability to supply such an enormous tonnage even at a small loss is a serious one.

Possibly the most regrettable event in connection with these two enterprises is the extent to which the coal property has depreciated during the last two years: not in respect of the coal itself, but of the extravagant expenditure which has been indulged in, and the great increase in the cost of production. The published statement of the directors, issued during the present month, shows that since the agreement between the Coal and Steel Companies, a year and a half ago, "the Steel Company has paid into the Coal department out of its ordinary resources the sum of \$1,480,000, and has given its notes for \$655,000 which have now to be paid." The whole of this money has been swallowed up in capital expenditure. Just how it has been spent may be seen from illustration. The total capital expenditure up to date on the New Dominion No. 2 mine has been about \$2,500,000, and the output at the present time is in the neighborhood of 2,000 tons per day. This is a larger sum than the total capital expenditure of the Dominion Coal Company in the purchase and equipment of the whole of its mines from 1893 to 1896 when the output had reached 1,200,000 tons per annum or twice the present capacity of Dominion No. 2. Of course this expenditure is destined to yield a very much larger output, but already it is clear that Dominion No. 2 is a gigantic mistake, and the cost sheet demonstrates that coal will never be produced so cheaply in an enormous mine equipped for 5,000 tons per day as in the older mines such as Dominion No. 1, Reserve and Caledonia with a limit of half that amount. The capital account in none of these individual mines stands today at more than \$500,000, and Dominion No. 1 had attained an output of 2,000 tons a day long before its capital outlay reached that figure. In 1893, the first year after the Dominion Coal Company acquired and operated the Cape Breton Mines the cost stated was \$1.15, according to published prospectus. After equipment the cost fell, in 1896, to 85c. a ton and the management promised that it would be 75c. the following year. Then came a change both in management and policy, and ever since the cost has steadily risen until now, as above stated, it is \$1.35. There is not a practical miner in the country who does not know that for mines situated so favorably as these are, this is a ridiculous cost which is not accounted for in any way by the comparatively moderate increases in wages which have been made, but rather by extravagant expenditure and laxity of control. It is extremely fortunate that during the last few years the selling price has been high, and this alone has



saved the Coal Company from disaster. Now that the tide has turned and prices are falling there is not a moment to lose. Competent expert economical control is called for in every department. The cost should be reduced, according to the best judges, at least 25c. a ton, and it is not unlikely that this will have to be done without any considerable reduction in wages as the increases have been much more moderate than elsewhere.

One cannot look at the general state of the coal and iron trades without realizing that 1904 will see the prices back very near where they were three years ago. Already pig iron has fallen in the States from \$26 to \$17 and mines are being closed in order to restrict production, and if possible maintain prices. This is a general condition both in the States, in Germany, in Belgium and in England, and we are evidently on the eve of one of those cycles of depression which have been persistent and regular in the history of the coal and iron trades. If so, whilst Canada may not suffer, and indeed will not suffer, as much as her larger competitors, prices will of necessity go down to some extent, and it will be with difficulty that even a home market will be retained to the extent to which it is at present controlled by the Canadian product, but if this is done it will only be at lower prices. The average selling price of Nova Scotia coal next year is likely to be \$2 a ton, possibly as low as \$1.75. This should still leave a respectable margin, but with the diminished tonnage dead charges will naturally raise the cost of production, unless this is offset by the effecting of economies. We consider that the Dominion Steel and the Dominion Coal Companies are at the parting of the ways, in more senses than one. Their experience has been most exceptional and unfortunate, especially in view of the generous protection accorded them by the Canadian Government, and we appeal to the industrial magnates who control them to arise to the importance of the crisis, and by the adoption of an economical policy and the establishment of efficient control to rescue these concerns from the position into which they have drifted, and which cannot long continue without plunging not only the stockholders but the communities which have sprung up around them into ruin.

#### **Ontario's Growing Mineral Industry.**

The mineral products of Ontario at the present time show a much greater variety than they did a few years ago. The last five years have seen a great revival in the mining of mica and other substances. Within the same period the mining of other minerals formerly not produced in the Province has been begun and the output has now reached comparatively large dimensions. Ontario can now show as great a variety in mineral products as almost any country of equal extent of territory. These include the ores of gold, silver, copper, nickel, zinc, lead, iron, together with smaller amounts of platinum, molybdenum and other rare metals. Then there are the non-metallic minerals or compounds, a number of which are being produced in increasing quantities, feldspar, graphite, corundum, actinolite, talc, white arsenic, iron pyrites, petroleum, natural gas, salt, peat, marble, and various clays and rocks for use in building and for other purposes, such as cement, calcium carbide and chemicals.

In connection with metal mining the increased interest being taken in the iron ore ranges of the northern and northwestern parts of the Province is especially worthy of notice. Large sums are also being expended on new plants by one of the nickel companies.

It is to the non-metallic minerals, however, that the Province owes her greatest increase in the variety of her productions. The

mining of feldspar which was begun less than three years ago is now rapidly growing in importance, and the potters of the United States are drawing on this Province for an increasing amount of their supply of this mineral.

During the last three years Ontario has been the world's chief producer of corundum. Both of the two companies operating are now greatly increasing the size of their plants.

During the past year or two petroleum and natural gas wells have been sunk in areas formerly not known to contain these materials in economic quantities. As regards salt, another of the older mineral products of the Province, it may be said that the output can be increased at any time the demand arises for a greater supply.

The production of refined graphite shows a satisfactory growth.

The production of peat briquettes is now assuming the form of a stable industry, and the numerous large deposits of this fuel which are known to exist in the Province gives rise to the belief that it will become an important industry.

The output of actinolite, a mineral which is used as a roofing material, is similar to that of former years. An experimental plant for the production of short fibre asbestos has been erected within the last few months.

The output of iron pyrites is increasing and new deposits are being opened up.

The demand for the different varieties of limestone is constantly growing and serves as an index to the increase in manufacturing in the Province. An important group of industries now use limestone as one of their raw materials. Among these industries are the following,—cement, pulp, beet root sugar, glass, calcium carbide, blast furnace, lime, and chemicals, such as acetate of lime, etc. There are also the uses of the rock as an ornamental, building and structural material. No systematic reports on the limestones of the Province have been published and users of the rock have had trouble in finding material of the desired character, a variety suitable for one use often not being adapted to another. For this reason the Provincial Bureau of Mines has undertaken the preparation of a report on the subject during the present season. The more important outcrops of the rock in various parts of the Province are being visited. The samples taken will be analyzed and users desiring a stone of a particular composition will be able to learn from the report when published where such is to be found. In the manufacture of beet root sugar, cement and certain chemicals a stone carrying a low percentage of magnesia is required. On the other hand in the sulphite pulp process, for example, a rock high in magnesia must be used. On account of the lack of knowledge concerning the occurrence of rock suitable for some of these purposes in the Province material has heretofore been imported. It will be seen from what has been said that limestone plays an important part in the mineral industry and is worthy of much more attention than it has as yet received in this country. At the present time the limestone industry is in a transition state. New uses are being made of the rock and cement is cutting into the field heretofore entirely occupied by stone and lime. The burning of lime in many localities is dying out on account of the increased price of wood for fuel.

Little is also known of the clays of Canada and it is time that a systematic study was made of them. Many of the States of the Union have detailed reports on their clay deposits, and the industry is there being developed on a scientific basis. On this side of the line we have neglected this industry in our chase after the more glittering minerals. The result is that we have no pottery industry of importance and our brick, cement and other industries in which clay is used as a raw material can be greatly enlarged.



### Alluvial Mining in Nova Scotia.

The general rule that alluvial mining precedes vein mining applies to Nova Scotia. It is true that here alluvial mining never rose beyond a temporary excitement, as the immediately following discovery of gold-bearing veins distracted attention from it.

In the early history we find references to the Acadians washing gold from the sands of the upper waters of the Avon river. A century after the ground covering the scene of the earliest mining in Tangier yielded notable amounts of gold for the few cubic yards of ground subjected to treatment.

At the Ovens, in Lunenburg County, the Atlantic, wearing into caves the auriferous slates, concentrated small amounts of gold on the beach. The discovery of these washings, limited but rich, caused much excitement. The field, however, yielded but a few ounces, and has since laid dormant. Local men are said still to secure a small wage by washing the sands continually re-assorted by the Atlantic surges. Similar but less rich sands occur on the beaches of Tancook Islands in Chester Bay. The slates yielding the gold at the Ovens contain many veinlets of quartz showing free gold, but hitherto no systematic attempts have been made to see if they could furnish a low grade ore.

At Gays River, in Colchester County, the basal carboniferous conglomerates were formed directly on the auriferous measures. The tumbled boulder making sea of that distant epoch rubbed out gold which was deposited in the slates at the base of the conglomerate. Years ago some little washing was done at the base of the outcrop of this conglomerate now hardened and compacted. An attempt was made to mine and crush the auriferous part of the conglomerate but it was soon abandoned. Later attempts at mining on a similar scheme have failed. It is evident that the gold channel of that period must be found, as in more modern cases, before a maximum of return can be anticipated.

To the late Mr. J. Campbell belongs the credit of showing the auriferous character of the soil at several points along the shore west of Halifax and around Halifax Harbor. Two years later it was reported that he and Professor Silliman had washed gold from the sands of Sable Island. Later tests, however, on the Island did not show gold. The fact seems to be that in nearly all the deposits of glacial origin more or less gold is found, but the presence of tenacious clay rendered its working expensive. The appliances of the present day, however, would probably be found equal to the disintegration and washing of this material. Where the glacial drift has been rearranged, and in the less thickly covered localities search should show pay ground. The course of the glacial movement being southerly, and the denudation being on an enormous scale the submarine banks adjoining the Coast must have received vast amounts of gold from the anticlinal domes.

Sherbrook, Mine Harbor, Tangier and Gold River in the early days furnished very considerable amounts of soil from the vicinity of the worked veins which was also crushed. As the results were reported together it is now impossible to form any estimate of the amount of soil treated.

At Moose River the alluvium covering the veins has been largely treated. Separate returns are not available beyond the statement that there were crushed in the Moose River ten-stamp mill of Mr. Touquoy from 1888 to 1898, 60,943 tons of slate and surface ground, including a few small lots, say 200 tons, of rich quartz, which yielded 8,640 ounces or an average of about 2 dwts. 20 grains.

Among other localities showing alluvial gold may be mentioned

the Nine Mile and Leander rivers, Renfrew, the southern part of Waverly.

In Cape Breton the Middle River of Baddeck has yielded alluvial returns, and the presence of rich lodes is known in the vicinity. At Whycocomah the streams flowing from Lewis Mountain show gold, and in some cases good wages have been made with working tests. In nearly all the streams flowing from the pre-cambrian plateau of Victoria and Inverness counties show gold. The working of a few small rich bars in the Cheticamp River led to prospecting in that vicinity which has shown lead and copper deposits carrying decided gold and silver values, which are now being systematically tested.

It is true, so far as any attention has been paid to the subject, that there may not be in this Province the enormous deposits of auriferous gravel which with the aid of large water powers have attracted extensive investments of capital to wash with water brought for miles millions of tons of alluvium to glean a profit from their scanty contents. It may be stated, however, confidently, that the deposits here are richer, and in many cases capable of development at a small cost.

The extent of ground which has been enriched by the denudation of the anticlinal folds corresponds with that assigned to the gold fields by the geologists. As the gold field is traversed longitudinally by numerous anticlinal folds, and each fold has been subjected to a denudation of from 500 to 2,500 feet it is evident that incalculable amounts of gold have been torn from their matrix and distributed to the south of their original resting place.

### Ontario's Minerals.

The twelfth annual report of the Ontario Bureau of Mines has been published since our last issue. The volume is a large one, containing some 354 pages of matter printed in leaded bourgeois type, profusely illustrated by half-tone cuts and zinc etchings, and accompanied by two geologically colored maps. It covers the whole range of the Province's mining industries, and gives much useful and interesting information concerning the mineral resources of Ontario and the progress which is being made in their development.

The statistics presented in the report are for the year 1902 and have already appeared in these columns. As compared with 1901, the advance in value was considerable, the aggregate for 1902 being \$13,391,634 as compared with \$11,831,086 the previous year.

The mineral products of Ontario make up a long and varied list, but the output of many of the minor substances is insignificant. Of the metallic products, nickel, pig iron, steel, copper and iron ore comprise the bulk. Nickel is the peculiar metal of Canada, and the mines of the Sudbury region are evidently capable of production on a scale equal to any conceivable demand. The nickel contents of the Sudbury mattes made in 1902 amounted to 5,945 tons, much the largest output on record, notwithstanding the slackening of the rate of output during part of the year consequent upon the consolidation of the nickel interests early in 1902. Dr. A. P. Coleman, professor of geology in the University of Toronto, deals with the Sudbury nickel deposits in the report at some length. He describes the governing feature of the nickel region as a great eruptive band of norite enclosing an elongated area of Cambrian rocks about 35 miles long and 8 miles wide, all the chief mines of the district being situated on the basic edge of this band or on dike-like offshoots therefrom. Dr. Coleman suggests that this nickel-bearing band of eruptive rock has in reality a basin shape, and that the separation of sulphides was essentially the result of gravitation, the heavier materials going to the bottom in the process of cooling. He distinguishes two classes of deposits, (1) those



along the southeastern margin of the main range, often crowded into bay-like indentations of the adjoining rock, and (2) those strung out along the narrow offshoots from the main range. A third and rarer type is that of the Vermilion mine, which has no visible association with any gabbro or norite band. A brief description is added of the principal mines and mining companies. Since the beginning of operations in the Sudbury region about two million tons of copper-nickel ore have been raised, from which 32,150½ tons of nickel and 31,746¼ tons of copper have been obtained. Plans and sections of a number of the mines are given—the first time we have seen the ore bodies in the nickel mines thus outlined. Most of Dr. Coleman's work last year was done on the southern or main range, where Dr. Barlow of the Dominion Geological Survey has also been at work. We understand that during the present year the former has followed up his studies by an examination of the northern range where some extensive ore bodies exist, on which but little development work has been done owing to lack of railway facilities. Drs. Coleman and Barlow are two of the most capable of our Canadian geologists, and the results of their work ought to be of great scientific interest and practical utility.

A considerable part of the report is devoted to the iron ores and ranges of the Province. Prof. W. G. Miller, the provincial geologist, enumerates the iron ranges of northern Ontario and concisely describes their characteristics; and the new magnetite deposits in and near the township of Hutton which are likely to prove important, are dealt with briefly by Prof. W. K. Leith of the U.S. Geological Survey. A paper on the magnetic concentration of iron ores by J. W. Wells is timely and interesting, in view of the many deposits of low-grade ores in Ontario.

The mines of northwestern and eastern Ontario are described in detail by the mining inspectors, Prof. Miller and Mr. W. E. H. Carter, from notes made during the course of their official visits. Two hitherto little known regions, one on the Mississauga and the other south of lake Abitibi, are respectively described by Mr. L. C. Graton and Mr. L. L. Bolton, geologists attached by the Bureau to surveying parties. The upper stretches of the Mississauga appear to be almost wholly in Laurentian rock, while between Round lake and Abitibi the predominating Huronian formations are for the most part overlaid by large areas of fertile soil. The reports of good agricultural land in this section of new Ontario have been confirmed by further explorations during the present year.

A feature of the Bureau's work from the beginning has been the prominence given to the question of peat fuel, the special interest of Ontario being due to the fact that the Province is without workable seams of coal. Some 44 pages of the report are occupied by a paper on the manufacture and use of peat as fuel, in which a pretty full account is given of the methods of preparing this article in Europe and America. The opinion is expressed that compressed peat is likely soon to take a prominent place in the industrial economy of the nation, and that in efficiency and cost it will compare favorably with coal. This subject of peat fuel has been long before the public, and it is time some practical results were forthcoming. We trust the Bureau of Mines is not pursuing an *ignis fatuus*, and that the test of every-day use will speedily demonstrate the superior qualities of peat as fuel. So long as coal is to be had, however, we have our doubts as to the likelihood of this water-retaining material becoming the fuel of the country.

The gold mines of Ontario are proving more or less of a disappointment. The yield of gold was less last year than in 1898, and much less than in 1899. In the Lake of the Woods and Rainy River regions little gold is being won at the present time, notwithstanding that auriferous quartz has been found in very many and widely separated localities. Michipicoton and Hastings County are doing better,

and seem to be contributing more largely to the gold output than any other sections.

From the palaeozoic rocks of older Ontario a variety of useful substances is obtained, including petroleum, salt, natural gas, gypsum, and in the eastern portion of the province, mica, talc, graphite, corundum, iron pyrites, feldspar and arsenic. Building stone, brick and other clay products, lime and cement form an important group yearly growing in aggregate output. The Portland cement industry is developing rapidly, the raw materials, bog-lime or marl and clay, being abundant. The production last year was \$916,221 in value as against \$563,255 in 1901, and several new plants are in course of construction.

Altogether the Bureau of Mines is to be complimented on having in its Twelfth Report maintained the high standard of its previous volumes, and Ontario is to be congratulated on the advance which its mineral industries continue to make.

## EN PASSANT.

The Royal Commission appointed in England in 1901 to inquire into the coal supply of the United Kingdom, has presented its first report, consisting of the evidence given by the witnesses of whom a large number have been examined. The subjects allotted for investigation by the Commission included the extent and available resources of the coalfields of the United Kingdom, the rate of exhaustion which may be anticipated, the effect of coal exports on the home supply, the possibility of a reduction in cost by cheaper transport, avoidance of unnecessary waste in working, or a change in the usual terms of mining leases, and the probability of Great Britain maintaining its competitive power with the coalfields of other countries. The evidence submitted bears almost entirely upon three points, (1) the limit of depth in mining coal, (2) the minimum thickness of workable seams, and (3) waste in working. As to the first of these points, the Commission has adopted the view that coal seams lying more than 4,000 feet below the surface may for the present be regarded as unworkable. The inquiry not having been completed, no opinion is expressed regarding the available coal supply or its probable duration at the present or any future rate of consumption.

The output of the metalliferous mines and works in Ontario for the first six months of 1903, as returned to the Bureau of Mines, was as follows:—

|                      | Quantity. | Value.      |
|----------------------|-----------|-------------|
| Gold, ounces.....    | 5,842     | \$ 93,233   |
| Silver, " .....      | 23,100    | 11,550      |
| Iron Ore, tons ..... | 189,055   | 265,112     |
| Pig Iron, " .....    | 35,373    | 633,328     |
| Nickel, " .....      | 3,085     | 1,088,671   |
| Copper, " .....      | 1,860     | 268,393     |
| Zinc Ore, " .....    | 400       | 6,000       |
| Total value,         |           | \$2,366,287 |

The corresponding output for the first six months of 1902 was \$2,902,722.

Most wonderful reports are still coming to hand as to the marvelous richness of the discoveries of gold in the Lardeau District, British Columbia, on Poplar Creek. If the one hundredth part of the stories in circulation as to the richness of the quartz in the Lucky Jack and other claims staked on the creek should prove to be founded on fact, then indeed a find has been made which will be of inestimable benefit to the district in particular and the province and



country in general. The gold is said to be found in boulders ranging in weight from fifty to a thousand pounds or more, and fine gold is sticking out all over. In conversation a few days ago with an English gentleman closely identified with large mining interests, who has just visited the creeks as a member of the British Chambers of Commerce party, the Review is informed that the finds appear to be remarkably rich indeed, and that all the members composing the excursion were very much surprised at the showing. He, however, concluded by saying with characteristic British caution, "But then you know all is not gold that glitters, and English capitalists have suffered such heavy losses in the country that they will require considerably more evidence before plunging very heavily in the new ground."

Through the courtesy of Mr. L. Vogelstein, New York representative of Messrs. Aron Hirsch & Sohn of Halberstadt, Germany, we are enabled to give the figures of the German consumption of foreign copper for the months, January-July, 1903, compared with the same period of 1902-1901:—

|               | 1903.        | 1902.        | 1901.        |
|---------------|--------------|--------------|--------------|
| Imports ..... | 49,263 tons. | 47,765 tons. | 38,842 tons. |
| Exports ..... | 6,283 "      | 5,517 "      | 5,449 "      |
| Consumption.  | 42,980 "     | 42,248 "     | 33,393 "     |

Out of the above, the imports from the U.S.A. were as follows:—

|  | 1903.        | 1902.        | 1901.        |
|--|--------------|--------------|--------------|
|  | 36,549 tons. | 35,780 tons. | 26,921 tons. |

#### Notes on the History of the Mineral Industry in the Nineteenth Century.

By WILLIET G. MILLER, Toronto, Ont.

On reading an interesting review of the progress of the mineral industry in the Nineteenth Century, written a year or two ago by Prof. Treptow of Freiberg, it occurred to me that the subject would be a good one to bring before the members of this Institute.\*\* A knowledge of the wonderful progress which has been made in our industry in the last century should afford us encouragement for the future.

Prof. Treptow is a member of the staff of the Freiberg School of Mines, an institution which has itself played a very important part in the great advancement which has been made in mining and metallurgical methods during the last hundred years. This technical school has also, we might say, had much to do with the immense increase which the last century has witnessed in the volume of mineral products, its graduates having been pioneers in almost every great mining country of the world.

Prof. Treptow's paper gives a handy summary of the statistics of some of the most important mineral substances, together with a sketch of the early utilization of minerals which first came into commerce in the century just closed.

In the following notes I have summarized Prof. Treptow's paper, and have taken the liberty of rearranging some of the material and adding a few notes so as to make it more applicable to this side of the Atlantic.

The history of mining, or in a wider sense the mineral industry, in the 19th century is characterized by a great advancement in technology and a corresponding enormous increase in production over earlier times. There has also been a great widening of geographical boundaries. As a result of the period of great geographical discoveries in the 16th century practically only Mexico and a part of South

America were added to the list of mining countries. In the 19th century North America, a great part of Asia, Australia, and finally South Africa become great centres of mining activity and eclipsed in production the older countries.

In the 19th century the industry has done much to promote the cause of civilization, and has opened up many remote and previously little known parts of the earth. In this connection it is only necessary to mention the great effects which have resulted from the rush of gold diggers to California in the late 40's and to Australia in the early 50's.

Mining has been wonderfully influenced by the progress which metallurgy and the chemical industry have made in the century. The development of the science of chemistry, which can hardly be said to have existed at the end of the 18th century, has greatly enlarged the use of previously known economic minerals and has also found uses for many others which, though known, were of no commercial importance.

#### THE PROGRESS IN TECHNOLOGY OF MINING.

Only the chief points in the progress of mining technology can be briefly referred to in the space at our command. The sciences of mineralogy, geology and ore deposits on the one hand and mining on the other have had a closely interwoven history. Even after the former had become distinct sciences they have profited from observations made by miners and from the opportunities which have been provided by mining operations for examining beneath the surface of the earth. Mining has also, it is unnecessary to say, been put under deep obligation for assistance received from these sciences.

Somewhat different is the relationship between mining and the construction of machinery. In the 18th century, and in some places still longer, the miner built his own machines, his whims, water wheels and other structures used in the art of the times. The widening use of steam gradually divorced the work of the miner from that of the machinist until at the present time while the mine manager may have something to say about the design of a machine its construction is left to others.

The advance to be made in the industry in the future, especially in deep mining, will depend not so much on the miner as on the mechanical engineer. This is seen in connection with the deep shafts which have been sunk, *e.g.*, in Michigan and in South Africa.

Steam machines of the earlier part of the century have been naturally largely superseded in deep mining by those using compressed air, in which great advances have been made in late years. Electricity is also beginning to play an important rôle in the operation of pumps and for other purposes in connection with mining.

Then there were the invention of the diamond drill in 1864 and development of the methods for obtaining oil and gas, the improvement in pumps, introduction of the use of nitro-glycerine as an explosive in 1862, the safety lamp for use in coal mines, 1815, and the improved methods of mine lighting in general. All of these inventions and improvements have made a wonderful change in the industry.

The advancement which has been made in ore-dressing machines since about 1850 is also of great significance.

Further, the perfection of metallurgical processes has made it possible to handle ores of so low a grade at a profit that workers in earlier centuries could not have been convinced of the possibility.

#### INCREASED PRODUCTION IN OLDER MINING OUTPUT.

Gold is the most widely prized mining product, and then follow iron, steel, and coal. The increase in production of these materials illustrates pretty well the advancement which has taken place in the whole industry. The production of these substances at the present time as compared with that of the last century shows also the great widening of geographical boundaries which has taken place. The three products which form the basis of all commerce show a striking

\*\* Die Geschichte des Bergbaus im 19. Jahrhundert. Vortrag gehalten vor der Naturforschenden Gesellschaft in Danzig von E. Treptow, Professor an der Königl. Sächs. Bergakademie zu Freiberg i.S. Mit 1 Karte und 3 Tabellen. Freiberg 1901.



difference in value. While 1 kg. of gold in the world's market has a fixed value of about \$700, 1 kg. of iron at the place of production is worth something like 2½ cents, and 1 kg. coal about ¼ cent. The high value of gold permits its mining over all parts of the earth. Gold mining withstands the difficulties of every climate and unfavorable geographical situation. While the production of iron and the winning of coal can only be carried on successfully on a large scale, and they are dependent on trade conditions.

The changes which have taken place in gold production during the last hundred years, as regards quantity and origin, are shown in the accompanying table. It is compiled from the works of the well-known statisticians Soetbeer (1800-1875), Hauchecorne (1880-1890), and Rothwell. Only those time periods are given in the table which indicate a striking change in production, and only the larger producers among the countries. Whole numbers give yearly production in kilogrammes; in the first part of the table the average of ten years, then every five years, and finally in most recent times the individual years are given. The order of the countries in the table is based on amount of production.

TABLE I.  
GOLD PRODUCTION IN THE 19TH CENTURY.  
(The yearly production is given in kilograms. One kilogram = 32.1507 Troy ounces).

|                             | 1801-10 | 1821-30 | 1841-50 | 1851-55 | 1856-60 | 1871-75 | 1885    | 1890    | 1895    | 1898    | 1899    | 1900    | REMARKS                                                                                                                                                                                                                                                                                                                         |
|-----------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transvaal                   | 165     | 3,375   | 22,515  | 24,730  | 26,570  | 33,380  | 38,125  | 38,345  | 51,161  | 37,217  | 36,056  | 34,744  | S. African War, 1899                                                                                                                                                                                                                                                                                                            |
| United States               | 110     | 110     | 17,600  | 88,800  | 77,100  | 59,500  | 47,848  | 49,421  | 70,470  | 97,933  | 109,783 | 103,000 | Cripple Creek, 1891                                                                                                                                                                                                                                                                                                             |
| Australia                   |         |         |         | 67,700  | 86,700  | 59,900  | 41,287  | 44,851  | 64,473  | 93,732  | 119,186 | 113,362 | West Australia, 1889                                                                                                                                                                                                                                                                                                            |
| Canada                      |         |         |         |         |         |         | 1,679   | 2,506   | 2,876   | 20,614  | 31,675  | 39,121  | Klondike, 1896                                                                                                                                                                                                                                                                                                                  |
| Russia with Siberia         |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| British India               |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Mexico                      |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| China                       |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Guiana                      |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Columbia                    |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Africa, excepting Transvaal |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Austria-Hungary             |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Germany                     |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Brazil                      |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Venezuela                   |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Peru, Bolivia, Chili        |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Other Countries             |         |         |         |         |         |         |         |         |         |         |         |         |                                                                                                                                                                                                                                                                                                                                 |
| Total                       | 17,778  | 14,216  | 54,759  | 197,515 | 206,058 | 170,675 | 155,165 | 185,675 | 305,025 | 435,076 | 473,028 | 393,888 | Note — The reason for not giving in this table the production of some countries in the earlier part of the century, is due, in some cases, to lack of statistics, and not on account of there being no production. In the case of other countries, e. g. Canada, the statistics have little value for the purpose of the table. |

In the first decade of the century Austria-Hungary was the only country in Europe which produced an important amount of gold. This was derived chiefly from the well-known mines of Hungary and Siebenburgen. A little also came from the old gold district of Bohemia and

other localities. The production of Austria-Hungary has increased quite gradually in the course of the century.

The production of Africa in the earlier years is estimated. In the first part of the century gold came only from the Niger country and reached Europe by caravans to the Mediterranean. In later times Rhodesia has also produced gold. The centre of production in these early years lay in Central and South America—Mexico, Columbia, Brazil, Peru, Bolivia, Chili, affording about 75 per cent. of the output in the first decade.

In Germany the production in the early part of the century was so small that it is not given separately. Gold ores do not occur in important quantity, the metal that is produced in that country occurring in small amounts in association with copper pyrites and other minerals and being obtained through smelting these ores. Considerable gold is however produced from imported ore and from the refining of what may be called scrap gold.

In the second decade an important decrease took place in the noble metal production of Spanish America, as a result of political disturbance caused by the separation of the individual states from the mother country.

The first large Russian output of over 3 000 kg. yearly is due to the beginning of mining in the Urals, from the year 1820. A decade later the western Siberia gold mines began operations. If we follow the Russian production still further we find that in the fifth decade there is a sudden rise to 22,500 kg., and in the year 1895 the output has gone up to 50,000 kg. These increases were due to the finding of easily worked alluvial deposits. The decrease at the end of the century is due to influences connected with the building of the Siberian railway.

At the end of the first half of the century came in two wholly new gold producers, California and Australia. In the year 1848 alluvial gold in great quantities was found in the former country. A gold fever such as up to that time the world had not known affected not only North America, but made itself felt much more widely, and a rush was made westward to the little known domain. Shortly after, in the year 1851, the first gold discoveries were made in New South Wales and Victoria, Australia, and some years later in Queensland and New Zealand. It was owing to these easily worked alluvial deposits that the world's production in the 50's reached a point which had never before been attained and which was not equalled for many years afterwards. North America and Australia remain from that time for four decades at the top of gold producers.

The discovery of the Comstock lode in Nevada in 1858, the greatest of its kind known, and the celebrated Mount Morgan in Queensland, discovered in 1873, and Bendigo in Victoria gave an impetus to lode mining. Up to 1890 the Comstock lode produced something like \$150,000,000 in gold and \$200,000,000 in silver, and mining had then reached a depth of 1005 m. or about 3,300 feet.

If we now glance at the year 1885, we see that the table gives the production of Germany, China and Venezuela separately for the first time. British India and Canada are also similarly treated, and it is seen that the production in Central and South America has noticeably shrunk.

In the last ten years of the century the gold production has materially changed. Especially is one struck with the totals, which differ so greatly in this decade from the preceding four decades.

The increased production during this decade was brought about through the discovery of the celebrated South African deposits at Johannesburg in 1888, whose output has grown with such surprising rapidity. The Transvaal is the first country which reached an output of 100,000 kg. Along with this comes the discovery of the West Australian gold fields in 1889, the most important districts being Coolgardie and Kalgoorli. Through these Australia reached a second



maximum of production, the first being about 40 years earlier. Finally are to be noticed the discovery of the Cripple Creek gold field in 1891 and the beginning of the operations in the Yukon in 1896. Canada through this last took her place as a gold producing country of the second order. The United States in 1899 for the first time had an output of over 100,000 kg.

The total gold production of 1899 had a value of \$331,000,000, or 1,324,000,000 M., which, however, would occupy a space of only 25 cubic metres.

According to Soetbeer, the total yearly production in the three preceding centuries fluctuated as follows:—

|                       |           |           |
|-----------------------|-----------|-----------|
| 16th century, between | 6,000 and | 8,500 kg. |
| 17th “ “              | 8,300 “   | 10,600 “  |
| 18th “ “              | 12,800 “  | 24,600 “  |

The chief causes contributing to the wonderful increase in production in the 19th century are the discovery of large alluvial deposits together with the developments which have taken place in milling, smelting and chemical processes. While smelting could be earlier applied to refractory ores, modern chemistry has added other methods of treatment. In 1848 Plattner discovered the chlorination process, and in 1888 Forrest added the cyanide process to the treatment of such ores. While in the first half of the century the chief gold produced was obtained from alluvial diggings, the end of the century witnessed the eclipsing of the product of this method of working by the output from lode mining.

It may be added that the second quarter of the century also witnessed the perfecting of the methods of separating gold from other metals, silver, copper and lead. Many old silver and copper coins held so much gold that it paid to separate it.

#### IRON.

We shall now take up a consideration of the iron production in the century just closed: Table II gives the amount for the beginning, the middle and the end of the century. The numbers for the years 1807 and 1854 are taken from "The History of Iron," by Dr. Ludwig Beck, 4th ed., 1899. The figures for 1900 are taken from Rothwell's "Mineral Industry."

The increase in the production of iron in the course of the century is at least as striking as that of gold. The increase in the output of the latter metal is thirty-fold, while the production of the former is now ninety times as great as it was at the beginning of the century. In the early part of the century the production of Great Britain and France exceeded that of all other countries. Then followed in order Russia, Sweden, and Austria-Hungary. Germany occupied the sixth place and was followed by the United States. In the comparison of the production of France and Germany in 1807 it should be remembered that at that time the latter country embraced a much less extensive territory than in later times, while the former included the output of Holland, Belgium and other territory. Great Britain stood far in advance of all other countries at that time in the production of the metal. The explanation is that the evolution of the steam engine took place in that kingdom, and the smelting of iron by means of coal, which had already begun to replace charcoal, placed this country in the van till after the middle of the century. The development of the railway in Great Britain, after Stephenson had shown his steam waggon in 1829, also increased the country's interest in the production of iron. The birth of these inventions in the island kingdom affords an adequate explanation as to why at the middle of the century she produced two-thirds of the total coal output of the world.

On the continent at the end of the 18th century attempts at smelting iron with coal had been made only in Upper Silesia. In all other districts smelting was confined to charcoal almost to the end of the first quarter of the century and in many places till much later. Then

the higher cost of wood and in many places the lack of it, together with the tendency towards the use of coke, brought about a change in the industry, the relative standing of such countries as Sweden and Spain where coal is wanting being greatly altered. A highly developed iron industry is to-day only possible where iron ore and coal occur in large quantities near each other or where, as in the United States, the means of transportation are exceptionally well developed. The production at the present time is also successful only where the material can be turned out in very large quantities and where there is a corresponding large market near at hand.

Brief reference may be made to inventions which have contributed much to the great increase in production of the metal, such as air heating and the evolution of the present type of furnaces; the use of rolling mills and steam hammers in place of hand labour; the Bessemer process, invented in 1856, and that of Gilchrist and Thomas in 1879, through which come the direct production of steel in large quantities and the making possible of the use of iron rich in phosphorus; the use of aluminum in iron castings, and the alloys of manganese, chromium, tungsten, nickel and molybdenum. The iron industry owes in the case of these alloys very much to modern chemistry.

TABLE II  
PRODUCTION OF IRON AND STEEL IN 1,000 METRIC TONS.

|                     | 1807  |           | 1854  |           | 1899   |        |                |           | 1900   |        |
|---------------------|-------|-----------|-------|-----------|--------|--------|----------------|-----------|--------|--------|
|                     | Iron  | Per Cent. | Iron  | Per Cent. | Iron   | Steel  | Iron and Steel | Per Cent. | Iron   | Steel  |
| United States . . . | 24    | 3'        | 1,000 | 17'       | 13,839 | 10,737 | 24,576         | 36'5      | 14,009 | 10,382 |
| Great Britain . . . | 250   | 33'       | 3,000 | 52'       | 9,454  | 4,933  | 14,387         | 21'       | 9,003  | 5,130  |
| Germany . . . . .   | 35    | 4'6       | 257   | 4'5       | 8,029  | 6,290  | 14,319         | 21'       | 7,549  | 6,645  |
| France . . . . .    | 225   | 30'       | 600   | 10'       | 2,567  | 1,529  | 4,096          | 6'        | 2,714  | 1,565  |
| Russia . . . . .    | 84    | 11'       | 200   | 3'5       | 2,600  | 1,400  | 4,000          | 6'        | 2,895  | 1,830  |
| Austria-Hungary .   | 50    | 6'6       | 225   | 4'        | 1,300  | 660    | 1,960          | 3'        | 1,311  | 1,145  |
| Belgium . . . . .   | ..... | .....     | 300   | 5'        | 1,036  | 730    | 1,766          | 3'        | 1,161  | 655    |
| Sweden . . . . .    | 75    | 10'       | 155   | 2'7       | 524    | 258    | 782            | 1'        | 526    | 300    |
| Other Countries . . | 16    | 1'8       | 80    | 1'3       | 1,052  | 583    | 1,635          | 2'5       | 625    | 400    |
| Total . . . . .     | 759   | 100'      | 5,817 | 100'      | 40,401 | 27,120 | 67,521         | 100'      | 39,793 | 28,052 |

The last space of the table shows the present situation of the iron and steel industry in various countries. The United States stands easily in the first place. In the second class together are Great Britain and Germany. Then follow at a considerable distance France and Russia; then Austria-Hungary and Belgium, and finally Sweden. It is clearly seen that the iron industry reaches large proportions only in North America and Europe. The whole of South America, Africa and Australia possess no modern furnaces; only in Asia has the modern industry begun to take a solid footing. Through the building of the Siberian railway some of the older iron works, *e.g.*, Petrowsk in the Trans-Balkans, which has been established about 100 years, have begun to take on new life. China has had for some years a steel works at Hanyang, and Japan has a similar works which was recently completed in the vicinity of the port of Wakamatsu. There is also a native iron industry in the Himalayas, in Japan, in many parts of Africa, *e.g.*, in German Togo, but the quantity of iron produced in these districts is insignificant.

#### COAL.

The coal industry is in a similar position to that of iron, since it depends not only on the occurrence of the material, but also on the market for it. Table III gives the situation at a glance. It may be stated that brown coal is produced in important quantities only in Germany and Austria-Hungary.

The development of the coal industry in the 19th century can be briefly described as follows:—At the beginning of the century it had



the standing of a great industry only in Great Britain, in the districts of Durham and Northumberland, which are at the present day important centres of the industry in the island kingdom. The yearly output at that time was from two to three million English tons (1 Eng. ton = 1016 kg.) On the continent there was in many places a coal mining industry, but the consumption was very small and was confined to the areas immediately surrounding the workings since the means of transportation was limited. In Germany the industry first became prominent about 1840, and in the United States about 1850. Great Britain in the middle of the century was even a greater leader in coal production than in that of iron. The result was due not only to the demand for coal in the industries of that country but was owing to the situation of the coal fields, either near the sea or on navigable rivers which favored the export of large quantities of the material.

TABLE III.\*

## COAL PRODUCTION IN 1,000 METRIC TONS.

|                   | 1850       |           | 1898       |           | 1899    | 1900    |
|-------------------|------------|-----------|------------|-----------|---------|---------|
|                   | 1,000 tons | Per Cent. | 1,000 tons | Per Cent. |         |         |
| United States.... | 5,776      | 9*        | 198,071    | 32*3      | 230,000 | 243,414 |
| United Kingdom..  | 45,328     | 67*       | 205,287    | 34*       | 223,616 | 228,772 |
| Germany.....      | 5,184      | 8*        | 96,310     | 16*       | 101,640 | 149,551 |
| France.....       | 4,437      | 7*        | 32,356     | 5*        | 32,331  | 33,404  |
| Belgium.....      | 5,820      | 9*        | 22,088     | 4*        | 22,072  | 23,462  |
| Russia.....       | 52         | .....     | 13,000     | 2*        | 13,100  | 15,000  |
| Austria-Hungary.. | 584        | .....     | 12,786     | 2*        | 12,694  | 39,027  |
| Australasia.....  | .....      | .....     | 6,414      | 1*        | 6,470   | 7,477   |
| Japan.....        | .....      | .....     | 6,000      | 1*        | 6,721   | 7,429   |
| India.....        | .....      | .....     | 4,679      | 0*8       | 5,016   | 6,216   |
| Canada.....       | 164        | .....     | 3,785      | 0*6       | 4,467   | 5,088   |
| Africa.....       | .....      | .....     | 2,550      | 0*4       | 239     | 495     |
| Spain.....        | .....      | .....     | 2,467      | 0*4       | 2,600   | 2,582   |
| Other Countries.. | 63         | .....     | 3,077      | 0*5       | 2,500   | 2,500   |
| Total.....        | 67,405     | 100.      | 608,870    | 100.      | 663,466 | 764,427 |

\*The statistics for 1850, 1898 and 1899 include only the production of "steinkohle," anthracite and true bituminous coal, of Germany and Austria-Hungary. The production of "brown" coal for the years mentioned was in Germany respectively as follows in thousand tons, 1522, 31649 and 34000. In Austria-Hungary the production of this coal in the three periods was 360, 25000 and 26045 thousand tons respectively. Coal mining in Japan according to modern methods dates from 1873. In the Transvaal the mining of this substance dates from about 1890.

It will be seen from the table that the relative output of the various countries has changed greatly during the century. In the last two years the output of Great Britain has, in spite of the fact that it had always been on the increase, been surpassed by that of the United States. After the former country comes Germany; then at a considerable distance France and Belgium, and finally Russia and Austria-Hungary. The coal industry flourishes in many other countries than those mentioned. Japan, India, Siberia, Canada, Transvaal and Australia produce important quantities.

The most important coal fields of Japan are on the southernmost part of the large island of Kiuschiu, the most important workings being at Miike. Other mines are on the northern part of the island in the vicinity of Tschikussen, whose shipping harbor is Wakamatsu, in the neighborhood of which are the recently erected steel works. There is also an important coal industry on the north island Jesso.

In Siberia coal mining has been carried on for some forty years, for supplying the Russian fleet in the Pacific Ocean. The new railway has given an impetus to coal mining in other parts of Siberia.

The districts in China in which there is an important industry lie near Kaiping, northeast of Tientsin with which they are connected by a railway. Other large coal fields are known in this empire.

The total of the year's production of coal on the earth in 1900 amounted to more than 700,000,000 tons. Since it is extremely difficult

to get a clear conception of this mighty mass we may state that this quantity of coal would form a cube which would have a length on its edges of something like 1 km. (=0.62 English mile).

If this mass of coal were placed on railway carriages, each of 10 tons capacity, a single train formed of them would have a length of 630,000 km. Since the earth's equator has a length of 40,000 km., a railway track long enough to accommodate these cars, all at one time, loaded with the yearly output, would girdle the earth nearly 16 times, one car occupying a space of 9 m.

The most important use of coal is in the production of steam for power; then there is the demand for fuel for household purposes. While, as already stated, coke was in use in Great Britain for smelting in the 18th century, it was so used on the continent and in North America first in the 19th. The production of gas for lighting originated in our own century. Both the last-named industries, the production of coke and gas, are of great importance on account of their by-products, tar and ammonia, which are obtained in large quantities.

Coal tar is at the basis of a highly developed branch of the chemical industry. From it a great variety of antiseptic and medicinal materials are obtained—creosote, used in the preservation of wood, naphthalene, phenol, salicylic acid, antipyrin, phenacetine and saccharine, which in many cases takes the place of sugar. Benzol must also be mentioned, being used in the chemical industry as a solvent for fats, etc. It also serves for the improvement of illuminating gas. From the tar industry are derived the analine dye materials which were made known through the work of the chemists A. W. Hoffman and W. H. Perkin, 1856. Two other important dye materials, alizarin and indigo, which have long been known, but which were formerly obtained from plants, have in recent years been artificially produced from distillates of tar.

The residue, or hard pitch, from tar distillation, which remains after a temperature of 400°C is reached, now plays an important role in a wider branch of the coal industry, viz., in the briquetting of fine or dust-like coal. It forms the binding material for the briquettes. The briquetting of coal and peat is becoming an important industry. In Germany in 1900 some 1,700,000 tons of the ordinary varieties of coal and 5,000,000 tons of brown coal briquettes were produced.

Paraffin and mineral oil have since 1855, in important quantities, been derived from brown coal. At the present time more than one million tons of this coal are consumed annually for this purpose.

## OTHER METALS.

In the production of silver, the United States takes the lead; then follow Mexico and Bolivia, then Australia, and in the fifth place Germany. A considerable part of the silver produced in the last named country comes, however, from foreign ores. The celebrated silver mining districts in the United States are the Comstock lode in Nevada, discovered in 1858, which has already been referred to, since in addition to silver it has produced much gold, and the deposits of Leadville, in Colorado, where operations were begun in 1876. In Mexico and Bolivia the mines are for the greater part short lived, but they have produced an important amount of silver. The mining here usually ceases at shallow depths since these countries have often been the scene of revolutions which deter capitalists from investing in machinery. Thereto has been added the lack of good coal and transportation facilities. In Australia the celebrated Broken Hill mines are large producers of silver.

The United States at the present time turns out three-fifths of the world's production of copper. This comes chiefly from two districts, the south shore of Lake Superior, in operation since 1855, although worked to some extent in pre-historic times, and Butte in Montana. The latter district has been known since 1877 as a producer of silver and gold. In 1883 its copper deposits attracted attention.



Next to the United States, Spain produces the greatest amount of copper, chiefly from the famed Rio Tinto mines, which were known to the Romans. Then follow Chili and Japan. In the former country copper mining has been active since 1855, at least "Chili bars" have since this year been quoted on the London Exchange. In Japan active metal mining dates from the end of the 60's.

In Germany the old Mansfield mines produce by far the most copper. In June, 1899, His Majesty the Emperor took part in the celebration of the 700th year of the working of these mines.

In Australia, whence comes an important quantity of copper to the world's markets, mining began in this metal with the discovery of the celebrated deposits of Burra-Burra in South Australia in 1845.

The demand for copper for use in electrical apparatus has given an extraordinary impetus to production, which in 1890 was 274,000 kg. and in 1899, 477,000. The price has also changed. At the beginning of the 90's it fluctuated between 90 Pf and 1 M. per 1 kg., and has since risen to 1.50 M. The result is that everywhere copper mining has taken on new life. How great the use of this metal is in Germany can be seen from the statement that in 1899 this country consumed 98,000 kg., a larger amount than that used by any other European country.

Other metals will now be referred to briefly. The great lead deposits of Leadville and Broken Hill have already been mentioned in connection with silver. The new tin workings on the island of Billiton are important, discovered in 1852. The metal has been known in the neighboring island of Banka since the 18th century. The deposits of Mt. Bischof in Tasmania, 1873, should also be mentioned. During the last hundred years a group of quicksilver localities have been found in New Alameda, New Idria and Sulphur Bank in California and Nikitowka in the South of Russia, since 1888. The celebrated quick silver deposits in Huancavelica in Peru, which produced a large quantity of material for the amalgamation of South American silver ore was, however, abandoned in 1830. This furnishes us with an example of the effects which the working of new deposits often has on the existence of older industries.

Among the most important mining industries of our century cannot be left out that of the celebrated Kimberly in South Africa. In 1867 diamonds were here found in rock in place, while these gem stones in all other districts occur in loose deposits or in detrital matter. The DeBeers Company, which now operates these deposits, absolutely controls the diamond market.

#### NEWER METALS.

To the group of seven metals of ancient times, the noble metals—gold and silver—mercury and the useful metals copper, iron and steel, tin and lead, with the alloys bronze and brass, have been added in our century an important number of new ones. The surprising fact is that during the first eighteen hundred years of the Christian era, only a single metal, antimony, which, alloyed with lead and other metals, came into use in the 15th century, was discovered.

The new useful metals of the 19th century are: zinc, platinum, nickel and aluminum, together with manganese, chromium and tungsten, bismuth and magnesium. There are thus added to the seven earlier known metals nine new ones, which are not mere chemical curiosities or parts of compounds, but metals which take a prominent place in industry and are used on a large scale.

In adding zinc to the group of the new useful metals of the 19th century, an explanation is necessary. The oxidized zinc ores—zinc carbonate and zinc silicate, commonly called calamine—were from very early times into the 18th century smelted with copper to form brass. In our century, however, zinc has been used by itself as a distinct metal, as well as in alloys. Dr. Helm has, it is true, described

as a curiosity a zinc object dating from prehistoric times, but not generally till about 1800 was zinc in use as a simple metal. The great quantity of zinc which, before the beginning of our century, was produced in England, and about 1800 in Silesia, Belgium and elsewhere, found application exclusively in alloys. The discovery, about 1820, that zinc could be vaporized if heated to 100° C, caused an important advance in its metallurgy. After this zinc began to be used in castings and in the plating of iron. In this way zinc has become an industrial metal of the 19th century.

The important zinc-producing countries at the present time are Rhineland, with the neighboring parts of Belgium and Holland, Upper Silesia and the United States. In the last named country the first zinc smelters were built, in 1850, shortly after the zinc deposits of Franklin in New Jersey, and Bethlehem in Pennsylvania, had begun to be worked. Especially important are also the Sardinian deposits, from which most of the ore is taken to Belgium to be smelted.

It is noteworthy that up to about 1850 all the zinc produced came from calamine. After this zinc blende came into use. Through this has resulted the re-opening of some very old mines in Rhineland which had formerly been worked for lead.

Platinum and nickel were known in the 18th century. The former metal was discovered in association with gold in Columbian sands in 1750. Nickel was recognized as a simple metal in 1779; but the industrial application of both of these metals belongs to the 19th century.

Attention was next directed to platinum through the discovery of it in the Ural mountains in 1819. In 1824 a considerable amount of it was produced. The desire of the Russian government to find some use for the metal which had accumulated in the treasury, resulted in 1828–30 in the coinage of it, there being something like 14,000 kg. coined. But the coin enjoyed no popularity, and soon came back into the treasury. First, about 1860, a demand arose for platinum through its growing use in connection with chemical manufacture, especially for laboratory utensils, and for vessels used in the production of sulphuric acid. Further applications have been found for the metal since 1880 in electric apparatus. The largest amount of crude platinum has always come from Russia, a little also being supplied by Borneo. The production of refined platinum is carried on in Germany and England; the yearly production amounts to between 4,000 and 5,000 kg. The price has been increasing for many years. In 1875, 1 kg. was worth about 1,000 M, while at the present time it is 2,300 M, or close to the value of gold. Platinum has, at one or two periods during late years, been higher in price than gold.

The closely related metals, palladium, iridium, rhodium, ruthenium and osmium, which occur associated with platinum, are obtained as by-products in refining this metal. Iridium is, on account of its extreme hardness, made use of in forming the points of pens. Osmium, which has the highest melting point of all known metals, and has up till recently been produced only in the form of powder or a spongy mass, is now used as a fine wire in electric lamps.

The production of nickel on a commercial scale dates from 1823. It was then, and for some time afterwards, used solely in alloys, namely, in nickel (German) silver. The customary composition of this alloy is 50–66 per cent. copper, 18.5–13 per cent. nickel, and 31–19 per cent. zinc or tin. Utensils, known as white copper and having a similar composition, come from China. Another important alloy of nickel, of the composition 25 per cent. nickel and 75 per cent. copper, is used in coinage. The Swiss used this first in coinage in 1850, later the United States, then Belgium and Germany in 1871. France has recently introduced her first nickel coin; it has a value of about 5 American cents. Through the endeavour to find new appli-



cations for the metal, it was learned how to roll and press it. This made it possible to use the metal in the manufacture of many useful articles, such as table and kitchen utensils, and to turn the metal into coins. The Austrian 10 and 20 half-penny pieces are composed of the pure metal.

Galvanic plating with nickel has risen to an important industry. Finally, since 1890, an alloy of approximately 5 per cent. nickel and steel—nickel steel—has been largely used for armour plate. This use gives rise to the largest demand for the metal.

Of similar interest to the wide application of the metal, is the change which has taken place as regards its productive territories. Outside of Schneeberg in Saxony, Scandinavia was one of the earliest producers of the metal. The chief and about the only producers of the ores of this metal are, at the present time, New Caledonia and Sudbury, the ore of the former country being a magnesian silicate and of the latter pyrrhotite. It may be added that small amounts of the closely related metal, cobalt, are practically always associated with nickel. The workings in New Caledonia were begun in 1874, and there was an important output in 1880. Development at Sudbury began in the later 80's. Inversely as the production of the metal has increased, the prices have fallen. The annual production is now about 7,000 tons, and the price per kilogram has fluctuated, during the 25 years of extraordinary expansion in production, from 10 to at times 30 M, according to changing demands, and has now sunken to about  $2\frac{1}{2}$  M.

The fourth of our modern industrial metals is aluminum. It was first produced as a metal in 1855, yet it was up to about 1890 so high priced—the price being something like 50 M per kg.—as to prohibit its becoming widely used. Cryolite served as the first raw material for this metal. This mineral is found in large quantities only at Ivigtut, on the southwest coast of Greenland, and has been mined in large quantities by the Danish government since 1857. The natural aluminum hydrate, bauxite, which occurs in large quantities in France and the United States, is now used as a source of the metal, and the use of the electric furnace in 1891 first made possible the production of the metal on the large scale. At the present time the price is only about 2 M per kg. In 1899 about 6,000 tons were produced.

The hope that aluminum, the specific gravity of which is only 2.6, would serve as a light metal, has not yet been fulfilled, since its use brings up many difficulties. Considerable amounts of the metal find use in the chemical industry, it being used as a strong reducing agent in the production of metals, *e. g.*, chromium, which are reducible with difficulty. In foundry work a little aluminum is sometimes added to molten iron in order to prevent the formation of blow holes in castings. It is also used quite widely for cooking and other utensils. Recently aluminum wire has begun to be used in the place of copper wire for the transmission of electricity.

Another important light weight metal is magnesium, its specific gravity being only 1.7, which is considerably less than that of aluminum. For more than 200 years magnesium sulphate, or bitter salt, has been known as a constituent of mineral water and medicinal springs. The metal was first produced by Davy in 1808. At the present time it is obtained in large quantities through the electrolysis of molten carnallite, a double compound of magnesium and potassium chloride, which comes in large quantities from the potash salts of north Germany. The metal finds use as powder, wire or strips, solely in the production of strong light in fireworks and photography. In spite of this restricted use, the yearly production is 5,000 kg. The tests which have recently been made of magnalium, an alloy composed of about 80 per cent. aluminum and 20 per cent. magnesium, are of interest. This alloy is a light metal, and is said to be superior in

many respects to pure aluminum. More important than the production of the metal is that of the artificial magnesium sulphate, which is used in great quantity in the cotton industry.

The metal bismuth was first produced in quantity about 1830, although it had been earlier known. It serves, in combination with lead and tin, for the production of an alloy which melts at a low temperature, and is used in safety apparatus for steam boilers and for other purposes. The salts of the metal are used in medicine. Bismuth ores are obtained in large quantities at Schneeberg, Germany, and a further supply of rich ores comes from Tasmania and Bolivia.

Finally, we may now consider the applications which the ores of manganese, chromium and tungsten have found in the second half of the 19th century, both in the chemical and iron industries.

In early times manganese ore, pyrolusite, was used as a source of oxygen. The metal itself is now largely used in alloy with iron, manganese steel possessing properties which make it extremely valuable for certain purposes. There are yearly about 1,000,000 tons of manganese ore produced, Russia supplying the greater part, followed by the United States and Spain, then come India and Germany.

About 45,000 tons of chrome ore are marketed yearly, the chief producers being New Caledonia, Russia, and Asia Minor. Like manganese, chromium finds use in the chemical industry in the preparation of various salts, and also in the production of chrome steel.

Only a small quantity of tungsten ore, some hundred tons, is consumed annually. It comes from the United States, Australia, and Zinnwald, Germany. Tungsten steel is a highly prized alloy for certain uses.

Molybdenum is another metal which is now beginning to be used in alloy with steel. For the manufacture of tools, such as chisels and planes, molybdenum steel is said to be especially valuable. There are only two known minerals which occur in quantity and contain molybdenum in large amounts. They are wulfenite and molybdenite. The former is found in quantity at Bleiberg in Carinthia and the latter is mined in Norway.

#### MINERALS IN CHEMICAL INDUSTRY.

We shall now pass from the metal industry to that of chemical manufacture. While the former was of importance at the commencement of the 19th century, the latter had scarcely made a beginning and was confined chiefly to the production of sulphuric acid, potash, sal-ammoniac, and saltpetre. Compared with the demands of to-day, the output was very small. We shall refer to those raw materials only which were first made use of in our century.

Since about 1850 an important and numerous series of experiments have thrown light on the value of mineral manures, after the agricultural chemists had set right the older views on fertilizers and shown that plants for their growth require certain elements, namely nitrogen, phosphorus and potassium. The raw materials for these are Chili saltpetre, guano, the natural phosphates, and potash salts. The slags produced in the working of phosphorus-holding iron ores by certain processes, which have already been referred to, are another source of this valuable element for use in agriculture.

Saltpetre, the potash variety, is formed widely where the remains of plants and animals, or the excreta of the latter, decay under favorable conditions. In the Province of Bengal, for example, this material is produced in large quantities by mixing earth with animal excreta, turning the mixture over from time to time, and after, it may be some years, washing out the salt with water. The saltpetre thus produced is largely used as a manure in the East Indies.

About 1821 large deposits of soda nitre, known as Chili saltpetre, were found on the rainless west coast of South America. This district is the chief source of the raw material for the saltpetre industry. The



nitre is found on the Rio Loa, the former great river between Bolivia and Peru, at Caracoles and Taltal. The raw material is there called caliche. The pure saltpetre is obtained by dissolving out the salt with water and allowing it to crystallize. An industry has been established since about 1830. In 1899, 1,360,000 tons of saltpetre were produced, about one-third of which went to Germany, the price being about 160 M. per ton at Hamburg. A large part of the Chili nitre is transformed to potash nitre by the use of the potash salts of North Germany, the potash variety then being known as conversion saltpetre. It is used as a fertilizer, and forms one of the chief constituents of gun powder. Nitric acid, which plays a great part in the chemical industry, is also produced from saltpetre. The greatest part of the iodine of commerce is obtained from the residues of the saltpetre crystallization.

The high value of guano depends on the fact that it contains a high percentage of ammonia salts and nitrogenous organic substances, as well as calcium phosphate. As the last mentioned compound is not soluble in water, the guano must, in case it is to be used as a manure, be treated like the naturally occurring phosphate, apatite, by the process invented by Liebig in 1840. In this process the phosphates, after treatment with sulphuric acid, give soluble compounds. Since the nitrogen-holding constituents of guano are soluble in water, it is evident that this material is only to be found in arid climates, such as that of Peru and Bolivia. This guano is known to be composed of the excreta and the remains of the food of sea birds. While the guano of South America has been used as a manure for over a century, it was shipped to Europe first in 1840, and the production has greatly increased since 1850. The most valuable guano deposits of South America are now exhausted.

The mineral, calcium phosphate, also serves as a raw material for the superphosphate industry. It is found in two forms, crystallized as apatite and rock-forming phosphate. The first occurs, *e. g.*, in South Norway and in Central Canada, and in the Spanish province of Estremadura, in large quantities; the rock phosphate, phosphorite, is found on the peninsula of Florida. These natural phosphates are insoluble in water, and must therefore be changed into the soluble form by the process already mentioned.

The rich store of potash salts, and associated magnesium salts, in north Germany, which at present monopolizes the world's trade in these materials, was first worked in 1861. At that time the industry was started at Stassfurt and Leopoldshall and later at numerous other points. Both production and demand increased remarkably quickly. 2,500,000 tons represented the total output up to 1899. A large number of works are engaged in treating this raw material, and the export trade is large, the trade being entirely in the control of the Kali Syndicate.

It may be stated that the valuable material bromine is produced from the residues of the potash salts. It, and the closely related element iodine, find wide application.

Boracic acid is also derived from a mineral found with the potash salts. Another compound of this acid, the natural borax, occurs in large quantities in the so-called borax lakes, *e. g.*, in California and Tibet.

Another industry, the winning of rock oil—international naphtha—has reached great importance during the last 40 years. Its beginning dates from 1859. In that year the first well was bored at Titusville in Pennsylvania. Raw oil and its products now represent not only a mighty home industry in North America, but an enormous export trade has also been built up. A second important rock oil locality is that of Baku on the Caspian Sea. This has been developed since 1870. The importance of the rock oil industry is seen from the fact that 16,000,000

tons of the material are produced annually. About half of this comes from the United States and half from Baku, while Canada, Austria, India, and Roumania produce comparatively small quantities. Oil has been discovered in many other places, *e. g.*, in the East Indian islands. German native production, which is very little, comes from the vicinity of Hanover and from some parts of Alsace. Thus nearly the whole German consumption depends on imports, which amounted, in 1899, to nearly 1,000,000 tons, valued at 65,000,000 M. The winning of oil and its transportation are somewhat unique industries.

We shall now refer briefly to some mineral products which are of comparatively small importance commercially, but which are of considerable scientific interest.

The compounds of thorium, cerium, and yttrium have had a commercial interest since Auer von Welsbach utilized them in the mantle of his gas lamp. His first patent was taken out in 1885. Previous to this, these compounds were known only as the constituents of certain rare Scandinavian minerals. The increase in price and demand for these materials gave rise to a diligent search for them. They were found in North America, and later in Brazil in the pea yellow mineral, monazite, which is the source of these earth's to-day. The last named country is by far the most important producer.

While 1 kg. of thorium nitrate in 1894-5 cost 2,000 M., the price now is about 30 M. Auer's mantle, the manufacture of which has produced a use for these rare materials, is now composed of 99 per cent. thorium oxide and 1 per cent. cerium oxide; the mantle holds about one-half gram of this mixture, and gives a nearly pure white light. The original greenish color of the light was due to the impurity of the thorium salts. From forty to fifty thousand of these mantles are now in use daily in Germany.

Lithia mica, lepidolite, which contains about 3 per cent. of the rare element, lithium, serves as the chief source of the lithia salts, which are used in medicine in connection with many complaints caused by urinary secretions. The yearly consumption of these salts is from 2,000 to 3,000 kg. Lithia mica occurs in large quantities at Zinnwald, in Germany.

Barium compounds are also used in important quantities at the present time. They include barium sulphate, known as barite or heavy spar, and the carbonate, witherite. The consumption is between 20,000 and 30,000 tons annually. The greatest quantity of heavy spar, after the material is ground and cleaned, serves as a valuable paint, known as permanent white, being for some purposes preferred to white lead. Barium salts, especially the chloride, find many applications in the chemical industry. Barite occurs in many places in Germany and elsewhere. Witherite is mined in large quantities, chiefly in the north of England.

Near these barium compounds stand the closely related compounds of strontium. The chief of these are strontianite, the carbonate, and celestite, the sulphate. Strontium salts give a red color to a flame, and are hence used in fireworks. Since 1871 strontium hydroxide has had an important use in the refining of sugar, as have also the hydroxides of barium and calcium.

Celestite is mined chiefly in Sicily, where it occurs in association with native sulphur.

Strontianite is mined in Westphalia. Germany imported in 1899 over 8,000 tons of strontium compounds.

Compounds of uranium, another somewhat rare metal, came first into commerce in 1830. The largest quantity of its ore, pitch blende, is produced in the silver mines of Joachimsthal, in Bohemia. Uranium is used in the glass industry to produce a yellowish green fluorescent glass. It is also used to produce black and yellow colors for painting porcelain.



We may now, in concluding this survey of the economic minerals of the 19th century, refer to the wide applications which have been made of mica and asbestos during the last 20 years. Both of these minerals have been known since ancient times, and various uses have been found for them in different ages. Each of the two is non-combustible, and in a high measure proof against the action of acids. They both conduct heat and electricity badly. The structural characteristics of both are striking. Mica is easily recognized by its thin, flexible and transparent cleavage plates. This makes the mineral valuable for certain purposes. For other purposes powdered mica is used. Asbestos, when of good quality, can be separated into fine fibres, which can be spun like cotton. The less valuable varieties serve for the production of paste board. In the powdered form it makes up an integral part of fire-proof paint. Both asbestos and mica find a wide use as refractory materials, and are used extensively in various forms as insulators. Quebec is by far the greatest producer of asbestos, which is the serpentine variety. Mica, suitable for commercial purposes, is found as a constituent of coarsely crystallized granites and syenites, the so-called pegmatites in India, the United States and elsewhere. The mica found under these conditions is the potash variety, muscovite. In Ontario and Quebec, which, with the countries just mentioned comprise the chief mica producers, the variety mined is phlogopite, magnesian mica. Sheets of phlogopite from one mine in Ontario, at times, have a diameter of 6 or 7 feet. Phlogopite occurs in deposits which evidently are of secondary origin, the constituents frequently including large crystals of apatite, pyroxene and calcite.

Other minerals, *e.g.* graphite and magnesite, are also used extensively as refractory materials. The wide use of certain minerals and artificial compounds for abrasive purposes may also be mentioned.

If we look at the testimony of mining in our century, we find that the technology of more than 20 mineral groups has been worked out. Uses have been found for some long known minerals, and the applications of others have been widely extended. Other minerals have been discovered during the century, and commercial uses have been found for them. Mining has thus, through the turning into wealth of such a vast variety of materials, added much to the prosperity of the peoples of the earth.

To complete our account of the progress during the century it may be well to glance at the wide geographical distribution of industries which mining now exhibits. Mining is carried on the farthest north on the European continent; a copper mine at Alten, south of Hammerfest, is in about 70° north latitude; there is important copper mining at Sulitjelma in Norway, about 67° north latitude; on the Swedish side there are iron mines as far north.

On the new Siberian islands in the Arctic Ocean, which reach to 75° north latitude, a peculiar kind of mining is carried on. The buried remains, some of which are in an almost perfect state of preservation, of mammoth are excavated from the everlasting ice. This mining is not so insignificant as one might think, since about 20,000 of these remains have been found in Siberia. As the remains are those of extinct animals, and are used not as specimens, but for what may be called true commercial purposes, the industry has a right to be called mining.

The cryolite mine, at 61° north latitude, in Greenland, has already been mentioned; then on the west side of the American continent are the Yukon gold fields, in 64° north latitude.

In the southern hemisphere mining can naturally not be carried on so far distant from the equator. The division of sea and land is there different from what it is in the far north. The most southern point where mining is carried on is Punta Arenas, in the straits of Magellan.

Here, at times, a supply of coal is secured. The nearest workings to this lie much farther north; they are the coal mines of Coronel. Near by are the copper works, in 37° south latitude. South Africa reaches only to about 34°, her most southern mines of importance being the diamond workings of Kimberly and the gold deposits of Johannesburg. On the island of Tasmania, which lies south of Australia, mining is carried on actively at various points. In the most southern part of New Zealand, Otago, profitable gold mines are in operation.

## MINING NOTES.

Boundary District.—To Sept. 5th the shipment made from the several mines is as follows:—

|                                        |       |
|----------------------------------------|-------|
| Granby Mines, to Granby smelter.....   | 1,231 |
| Snowshoe mine, to Sunset smelter.....  | 2,400 |
| Mother Lode, to Greenwood smelter..... | 3,520 |
| Sunset, to Sunset smelter.....         | 736   |
| Emma, to Trail smelter.....            | 330   |
| Oro Denoro, to Sunset smelter.....     | 759   |
| Athelstan, to Sunset smelter.....      | 225   |

Total for week.....9,201  
Total for year to date, 402,308 tons.

**The Ivanhoe Mine.**—The present staff at the Ivanhoe will be increased to about sixty miners, and the concentrator will work day and night for an indefinite period. The mill has been given an overhauling for an extensive run, and vast improvements in the machinery are under consideration for perfecting zinc milling. The present equipment is good, but the best is wanted to save all values. During the period of depression Manager Hickey took time by the forelock, and exploited the ground to a large extent. Ore was met everywhere a tunnel was driven, the whole mountain top appeared to be a network of mineral veins, the smaller ones containing solid ore and the larger concentrating. Besides these there are large zinc fissures which carry high values in silver, and from test shipments made and the returns received, which will be given attention once the profitable marketing of the Slocan zinc is assured.

**The Kootenay Mine.**—The Kootenay mine at Rossland has been closed down indefinitely. The crew of forty men is reduced to a single watchman, although a few men will be engaged at the property for a short time. The suspension is complete to all intents and purposes, however, and the announcement will be received with regret, moreover, it is intimated that a similar course may be followed at the Jumbo mine unless certain conditions are altered. A substantial increase in the treatment charges extended to the Kootenay mine was the direct cause of the suspension.

**The Granby Smelter.**—The Granby company, which had been closed down for a week to permit of the blowers being connected with the new furnaces, resumed operations on Sept. 9th when two furnaces were blown in. Two additional furnaces were to be blown in next day. On October 1st six furnaces with a treatment capacity of 2,200 tons daily, will be in blast.

**The Athelstan Mine.**—The Athelstan mine, Wellington camp, is shipping steadily and is gradually increasing the daily rate, although the ore must be hauled on wagons about a mile, and up hill at that. The ore is so easily mined however, that power drills are hardly necessary, picks and shovels being the chief tools needed. Excellent returns are said to be received from the shipments, which all go to the Sunset smelter at Boundary Falls.

**The Winnipeg Mine.**—Cars have been delivered to the Winnipeg mine, Wellington camp, for the purpose of making the first of the ore shipments since work was resumed at the mine. For the present, until the machinery is in full working order, the shipments from this mine will be on a small scale. Lumber has been delivered at the property, and work on the new gallows frame and compressor building is progressing, the shaft, in the meantime having been pumped out to the 100 feet level.

**Scarcity of Miners.**—A despatch to a western exchange dated the 11th inst. says:—The scarcity of men to work in the mines of the Boundary is being felt in no small degree of late. This is due to the fact that nearly all of the larger properties have been gradually increasing their forces, with the intention, now that a steady coke supply seems assured at the three smelters in this section, of keeping the present forces at work, and probably of increasing them. Efforts have been made to secure men from Victoria, Vancouver, Nelson, and Rossland, and there is work for a large number of such at good wages steadily. A number have come in this week to this camp, who immediately found work. As a result of the labor shortage and the absorption of idle men by the mines, it is almost impossible to secure a man for ordinary labor here at this time. The indications are that there will be plenty of work for all those who wish to labor in the Boundary all this fall and winter.

**Sydney Dry Dock.**—It is announced that a company in which H. M. Whitney, of Boston, a director of the Dominion Iron and Steel Company and Dominion Coal Company, is the prime mover, has been formed to establish a dry dock at Sydney. Advantage is to be taken of the recent legislation of the Dominion Parliament, guaranteeing 3 per cent. on a dock costing \$1,000,000 or upwards. The cost of the proposed Sydney dock is \$1,250,000. Work is to be resumed at once at the Dominion Iron and Steel Co.'s quarters at Georges river, which were closed down some time ago, throwing 300 men out of employment. About 200 men will be employed. The Dominion Iron and Steel Company is rushing work on their steel rail mill.



**Le Roi No. 2.**—The report of Le Roi No. 2 for the month of July shows that while the ore shipments were practically the same as during the preceding month, the ore values exhibit an improvement of \$4 a ton gross value, showing a gain in the net proceeds of nearly \$3. The freight, treatment, and smelter deductions show an increase of about 5s. per ton. The report of development is not altogether satisfactory; in referring to the No. 1 mine we are told "it is rapidly becoming difficult, and the sooner we can concentrate or get cheaper smelting rates the better." The oil concentrating plant will apparently soon be completely installed.

**Hastings (B.C.) Exploration Syndicate.**—At a meeting of the directors of this company which was recently held in London, the chairman referred to the valuable work done by their engineer, Mr. Leslie Hill, and stated that under his management and by exercising the strictest economy ore had been won which brought a gross return of \$44,000 after paying smelter charges, and a further sum had been received from the property which had been let on tribute. It is hoped that fresh discoveries may be made in the Arlington mine, and the company possesses coal lands at Blairmore which they regard as valuable.

**Dominion Coal Co.**—The output of the mines of the Dominion Coal Co. for August shows quite a decrease from the output of the preceding month. This is largely attributed to the scarcity of labor and its irregularity during the month. The miners are strong on picnics, preferring a day's picnicking to a day's pay at any time, and this year the month of August was prolific in picnics. This is the cause blamed for the falling off. Dominion No. 1 mine, which was the scene of a fire a few months ago, and the subsequent flooding, shows the gratifying output of 55,546 tons. Next month the Hub colliery will be a contributor to the output.—Coal Trade Journal.

**Nova Scotia Steel & Coal Co.**—The output of coal from the mines of the Nova Scotia Steel & Coal Co., Sydney Mines, for August, shows an increase of 3,022 tons as compared with the output of the previous month. The output of the respective mines was as follows:—Sydney No. 1, 21,275; Sydney No. 2, 11,961; Sydney No. 3, 8,540; total, 41,776 tons. The company will begin the installation of its electric plant this week in order to supply the machine shop, the general offices and blast furnaces with electric lights. The machinery has arrived, and it will be installed as quickly as possible.

**Cape Breton Coal Output.**—The output from the collieries owned and operated by the Dominion Iron and Steel Co., lessees of the Dominion Coal Co., for the month of August: Dominion No. 1, 5,546; Dominion No. 2, 57,283; Dominion No. 3, 37,661; Caledonia, 52,642; Reserve, 72,221; International, 18,785. Total, 244,138.

**N. S. Coal and Steel Co.**—The directors of the Nova Scotia Coal & Steel Company have declared a quarterly dividend of 2 per cent. on the preferred stock of the company for the quarter ended Sept. 30, payable on Oct. 15, to shareholders of record Sept. 20. They also declared an interim dividend of 3 per cent. on common stock, payable Oct. 15, to shareholders of record Sept. 30. Books to close Oct. 1 to 5.

**President Gold Mining Co.**—The Wabigoon Star, Ontario, says:—Among the mining propositions of the Manitou district which are attracting considerable attention is that of the President Gold Mining Co., of Cincinnati, of which Mr. Oberst Burbank, of Cincinnati, is the managing director. This company has an efficient management which is directing its efforts towards legitimate development and is not expending its resources in extravagant outlays on appurtenances which can very well wait until occasion requires their construction. So far the surface work on the President has been sufficiently advanced to warrant working on a larger scale, comfortable camps having been erected, roads built and the surface generally put in good condition. The shaft is now some 25 feet deep, a collar has been put in, and a contract for 100 feet of sinking will be let. Already there are ten tons of ore on the dump, all good rock and panning quite freely.

## NEW COMPANIES.

### ONTARIO.

**The Vera Mining Company, Limited.**—Incorporated under the statutes of Ontario, August 28th, 1903. Authorized capital \$1,000,000, in 1,000,000 shares of \$1 each. Directors—P. J. Finlan, D. B. MacDonald, P. Robinson, T. Robinson, L. McTavish, I. Rubenstein, C. A. Anderson, J. O'Boyle, J. A. Russey. Head Office—Sault Ste. Marie, Ont. Formed to acquire the properties known as "The Vera Mining Company, Limited."

**The Iron and Steel Company of Canada, Limited.**—Incorporated under the statutes of Ontario, August 21st, 1903. Authorized capital \$300,000, in 60,000 shares of \$5 each. Directors—C. E. Carboneau, H. T. Wills, J. F. Wills. Head Office—Belleville, Ont. Formed to acquire the properties known as "The Iron and Steel Company of Canada, Limited."

**The Lucinda Gold Mining Company, Limited.**—Incorporated under the statutes of Ontario, August 31st, 1903. Authorized capital \$100,000, in 20,000 shares of \$5 each. Directors—F. M. Dole, C. M. Dysinger, M. Gates, F. D. Root, A. E. Sharpe, P. R. Carter. Head Office—Sault Ste. Marie, Ont. Formed to acquire the properties known as "The Lucinda Gold Mining Company, Limited."

**The Manitoulin Portland Cement Company, Limited.**—Incorporated under the statutes of Ontario, August 28th, 1903. Authorized capital \$1,000,000 in 10,000 shares of \$100 each. Directors—H. G. Field, J. Carter, T. G. Ellis, R. F. Sutherland, W. Sherwood. Head Office—Windsor, Ont. Formed to acquire the properties known as "The Manitoulin Portland Cement Company, Limited."

**Northern Developing Company.**—Incorporated under the laws of the Territory of Arizona, and licensed under the statutes of Ontario, August 28th, 1903. Authorized capital for use in Ontario, \$40,000. John Joy, Gold Rock, Ont., Attorney. Formed to acquire the properties known as "Northern Developing Company."

**Provident Mining Company.**—Incorporated under the laws of the Territory of Arizona, and licensed under the statutes of Ontario, August 31st, 1903. Authorized capital for use in Ontario, \$1,000,000. James B. O'Brian, Toronto, Ont., Attorney. Formed to acquire the properties known as "Provident Mining Company."

**The Transcontinental Exploration Syndicate, Limited.**—Incorporated under the statutes of the Dominion of Canada. Capital stock, \$100,000. Directors—Sir Adolphe Caron, Sir Frederick Borden, R. J. Devlin, M. P. Davis, Ottawa; H. A. Ward, M.P., Port Hope; W. M. German, M.P., Welland; W. H. Harris, Tunbridge Wells, England. Formed to engage in locating, procuring, purchasing, working and disposing of gold, coal and other mineral lands, and timber and other lands in the Province of British Columbia or in the North-West Territories or elsewhere in the Dominion of Canada.

### BRITISH COLUMBIA.

**Luke Creek Gold-Copper Mining Company, Limited.**—Incorporated under the statutes of British Columbia, 10th August, 1903. Authorized capital \$1,000,000, in 1,000,000 shares of one dollar each. Formed to acquire the properties known as the "Luke Creek Gold-Copper Mining Company, Limited."

**The King Edward Mines, Limited.**—Incorporated under the statutes of British Columbia, 17th August, 1903. Authorized capital \$500,000 in 500,000 shares of one dollar each. Formed to acquire the properties known as "The King Edward Mines, Limited."

**Texada Mining Company.**—Incorporated under the statutes of British Columbia, 5th August, 1903, as an Extra Provincial Company. Authorized capital \$10,000, in 10,000 shares of \$1 each. Head Office—Tacoma, State of Washington, U.S.A. Head Office in this Province, Vancouver, B.C., W. E. Burns, Vancouver, B.C. Attorney. Formed to acquire the properties known as the "Texada Mining Company."

**The Cassiar Coal Development Company, Limited.**—Licensed under the statutes of British Columbia, 12th August, 1903. Authorized capital, \$300,000, in 3,000 shares of \$100.00 each. Head Office—Toronto, Ont. Head Office in this Province, Vancouver, A. J. Kappelle, Vancouver, Attorney for the Company. Formed to acquire the properties known as "The Cassiar Coal Development Company, Limited."

## PERSONAL MENTION.

Mr. D. R. Young of Vancouver, managing director of the Similkameen Valley Coal Company, has resigned his position with the Company owing to a disagreement with the directors over some questions of internal policy.

Messrs. Robert Jaffray, G. G. S. Lindsay, K.C., and Lieut. Col. Mason, of Toronto, who are directors of the Crow's Nest Pass Coal Company, have returned to Toronto after spending some time at the collieries of the company in East Kootenay inspecting the various plants and mines.

Mr. W. A. Carlyle, M.E., general manager of the Rio Tinto copper mines in Spain, was lately on a visit to the capital, stopping with Mr. J. A. Gemmill, barrister. Mr. Carlyle was at one time a distinguished science student of McGill university, and afterwards professor in that institution. He was also first head and organizer of the provincial bureau of mines in British Columbia, and then became general manager of the Le Roi mine at Rossland. He is now chief executive officer of works employing over eleven thousand hands.

Mr. C. C. Ray, of Ottawa, who has been spending a couple of months in Dawson city in looking over his interests has just returned to the capital. He states that shortness of water has been the means of closing down many of the placer workings much earlier than was expected. The Royal Commission on the Treadgold concession had only just opened when Mr. Ray was leaving the country, so he could not speak of its present progress or future results.

Professor Moses, who fills the chair of Mineralogy at the Columbia University of New York, is on a visit to British Columbia. While in the west he intends examining the great rock slide at Frank, N. W. T., and to look into the present condition of the mountain. Being a high authority on seismic and other disturbances, his opinion as to the stability of Turtle Mountain will be of considerable interest, not only to the residents of the district but to the scientific world at large.

Mr. C. Fernau, consulting engineer of London and Newcastle-on-Tyne is on a visit to the Kaslo district. He is mainly interested in the Monitor group at Three Forks. Mr. Fernau is quite an expert in the concentrating and reduction of lead and zinc ores, being connected with the Vieille Montagne Zinc Company, which is the largest in the world.

Mr. F. E. Woodside, of Vancouver, has been appointed Secretary of the Local Branch of the B.C. Mining Association, vice Mr. Sangster resigned. Mr. Woodside will commence his duties almost immediately.

Lieut. F. N. Gibbs, of Port Arthur, consulting engineer for the J. C. A. Henderson Mining Company, of Johannesburg, South Africa, and late of the 3rd Canadian Regiment, is now on a visit to America looking up the latest developments in mining machinery. He will spend sometime in Canada, and is very enthusiastic over the mineral wealth of the Transvaal.

Sir J. Beaven Edwards, chairman of the board of directors of the Slough Creek, Limited, in the Cariboo district, B.C., is now on a visit to the west looking over the Company's mines at Slough Creek and Lightning Creek, and expects to spend about a month examining the extent of the seasons operations. Referring to a meeting which was recently called in London by some dissatisfied shareholders, to consider the election of a new directorate. Sir John states that 75,000 shares were represented, which voted confidence in himself and his associates, and only 15,000 were looking for a change.



Mr. Clermont Livingston, general manager of the Tyee Copper Company, Limited, who has been on a visit to England, accompanied by his family, has returned to the west. He brings back with him on a trip, Messrs. E. B. Livingston, and J. Lancaster, of Coventry, England.

Mr. J. C. Drewry, of Rossland, director of the St. Eugene mine, a large lead producer of East Kootenay, is on a visit to Toronto. He states that the inability to secure satisfactory rates for freight and treatment from the Canadian smelters is the principal reason for the closing down of the mine.

Mr. W. Blakemore, C. & M. E., who has been spending the summer in British Columbia, has returned to Montreal where he will remain through the winter.

Mr. J. Hicks of Rat Portage, Ont., has gone to Prescott, Arizona, to take charge of the underground work of the Home Run Mine on Groom Creek, which has lately been purchased by Messrs. Douglas, Lacey & Co., the great mining brokers of New York city.

Mr. John L. Retallack, who spent the last five or six months in the capital, where he was looking after the securing of a bounty on lead ores, has since his return to British Columbia been selected as the Liberal candidate for the electoral district of Kaslo. The friends of Mr. Retallack feel confident of his success in the approaching election, as the excellent work done while in Ottawa in the securing of the lead bounty has made him many friends in the district.

Mr. Herman French, an English mining engineer of large experience, is now in the Newcastle district, Vancouver Island, examining and inspecting some mineral properties owed by a Victoria syndicate. Mr. French is a mining engineer with a distinguished record, and was before coming to this country superintendent of the Nina Cuatro Amigos mine, in Spain. While in the west he will be the special representative of a large London syndicate, which is deeply interested in British Columbia as a mining field, and now awaits Mr. French's reports as a result of which they may possibly make heavy investments.

Mr. Henry Mahun, managing director of the Société Minière de la Colombie Britannique, of Atlin, has been appointed attorney for the company in place of Mr. Emile Janne de Lamare.

Mr. Allan MacLean, of London, England, a director in the Kootenay and Velvet mining companies, is now on a visit to the Rossland district. During his visit to the country he also made a trip to Mexico, to look over the silver mining industry in that republic accompanied by Mr. Wm. Thompson, general manager of the Rossland-Kootenay Company.

Mr. Roscoe R. Leslie, superintendent of the Le Roi mine, has severed his connection with the company. Before leaving Mr. Leslie was presented with a magnificent solitaire diamond ring and a Brunton compass by the employees at the mine.

Mr. Ralph L. Broadbent of the Geological Survey, has been appointed to take charge of the Canadian Mineral exhibit at the great exhibition in St. Louis next year. The intention is to have a large mineral display from each of the Canadian Provinces.

Mr. Justice Britton, one of the commissioners on the Treadgold investigation which has been going on for some time at Dawson city, left for Ottawa immediately after the closing of the session on the 10th inst. Mr. B. T. A. Bell, the other commissioner, and editor of the Canadian Mining Review, will spend a week or two in the Yukon before leaving for Ottawa.

## Sale of Valuable Zinc Mine IN CANADA

Pursuant to the order of the High Court of Justice, for the winding up of the Grand Calumet Mining Company, there will be offered for sale by Public Auction at the Local Master's Office, in the Court House, in the City of Ottawa, in the Dominion of Canada,

**On the Sixth day of October, 1903,  
AT 2.30 P.M.**

Mining Location 30 T, in the District of Thunder Bay, in the Province of Ontario, containing 160 acres, and known as "The Zenith Zinc Mine." The property is about twelve miles from Rossport Station on the C. P. Railway. A considerable amount of development has been done, and about 2,000 tons of ore have been extracted.

The property will be offered for sale subject to a reserve bid, and to a royalty of \$3.00 per ton on all ore to be mined thereon. With it will be put up for sale, a quantity of mining plant and machinery, consisting of engine, derricks, cables, drills, carpenter's tools, blacksmith's tools, bar steel and iron, rope, saws, stoves, &c.

A detailed inventory of the chattels, an expert analysis of the ore, and any other information may be obtained from the liquidator.

Ten per cent. of the purchase money must be paid at the time of sale, and the balance in thirty days.

Dated the 13th day of June, 1903.

**E. A. LARMONTH,**  
Liquidator,  
48 Elgin St., Ottawa, Canada.

**W. L. SCOTT,**  
Local Master  
at Ottawa.

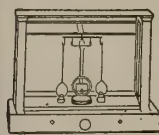
A recent issue of the Mining World, Chicago, says: Many shady mining brokers are fooling investors by issuing their weekly or monthly circulars, clothed in all the garb of legitimate mining newspapers. Subscription rates, advertising rates, publishing company's name, etc., occupy the usual space at the top of the editorial pages. Advertisements are circulated throughout the big city dailies, requesting those interested in mining to send for sample copies. None of those schemes are other than prospectuses, issued solely and exclusively in the interests of the broker or promoter, and about nine out of every ten of them are boosting the rankest "wildcat" schemes on the market. It is a mystery how the public can be fooled or misled by them, but they do thrive. None of the half dozen or more mining papers would publish the stuff these brokers use, and consequently they work it off on the public through these mediums.

## POGSON, PELOUBET & CO. PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

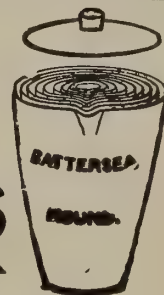
Correspondence invited.  
Prompt deliveries.



**The Chemists & Surgeons Supply Co. Ltd.**

CHAS. L. WALTERS (12 years with Lyman Sons) Manager  
818 Dorchester St. MONTREAL.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

## COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

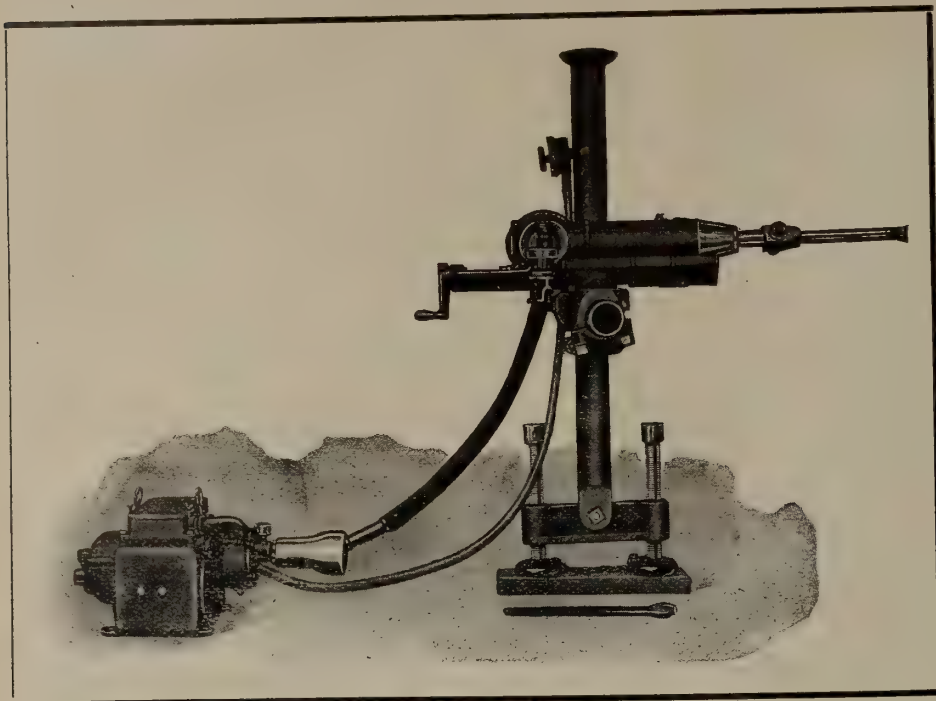
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

# Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.





# THE GARDNER ELECTRIC ROCK DRILL

A Mechanical Drill Electrically driven.  
It requires less Horse Power to operate  
than Air or Steam.  
No Pipes to install.  
Highest possible efficiency.

Write for descriptive Pamphlets.  
They will interest you.

## THE R. E. T. PRINGLE CO. LIMITED ELECTRICAL APPARATUS AND SUPPLIES

BRANCH OFFICES:

St. John, N.B. Toronto, Ont.

Head Office and Factory:

MONTREAL, P.Q.



### ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

#### THE CANDA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

### CHROME STEEL WORKS, BROOKLYN, N.Y., U.S.A.



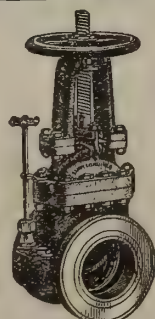
KENT AVENUE, KEAP  
AND HOOPER STREETS.  
F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

## THE LUNKENHEIMER



Flange Ends, with Outside  
Screw and Yoke with  
By-Pass.

The  
Lunkenheimer  
Victor Gate Valves are modern high-pressure valves, strictly first-class and constructed to give satisfaction. Made in standard sizes from 2 in. up, in screw and flange ends, with stationary or rising spindles, with and without by-pass, for 175 lbs. working pressures. Wearing parts made of bronze. Compact, heavy, durable, low priced.

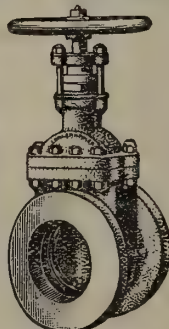
Specify the "Victor;" warranted to satisfy.  
Write for catalogue of high-grade Brass and Iron Engineering Specialties.

THE LUNKENHEIMER CO.

Sole Makers and Patentees, CINCINNATI, U.S.A.

BRANCHES:

26 Cortlandt St., New York.  
85 Great Dover Street,  
London.



Flange Ends, Stationary  
Spindle, no By-Pass.

## "VICTOR" GATE VALVES

### C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO

BUFF & BERGER.

SPECIALTIES:

Standard Instruments  
and Appliances for

Mining, Subway,

Sewer, Tunnel,

and all kinds of

Underground Work

SEND FOR CATALOGUE



# J. & J. TAYLOR

(TORONTO SAFE WORKS)

TORONTO, ONTARIO

MANUFACTURERS OF

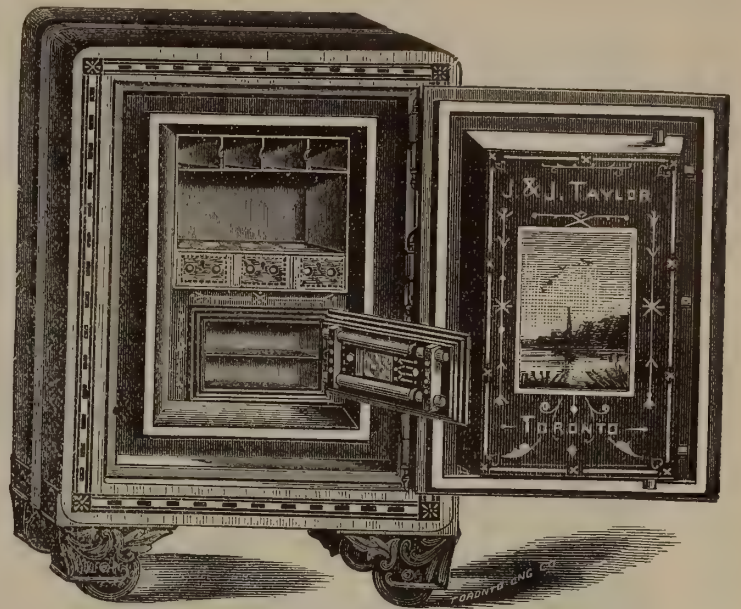
Bankers' Steel Safes

Fireproof Safes

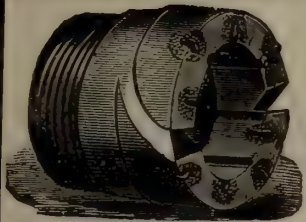
Jewellers' Safes

Vault Doors

Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

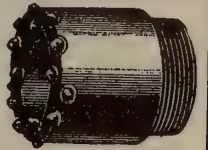
**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



## LAURIE ENGINE COMPANY

MONTREAL - - CANADA

# IMPROVED

# CORLISS

# ENGINES

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

FOR ELECTRIC LIGHT and POWER PLANTS.



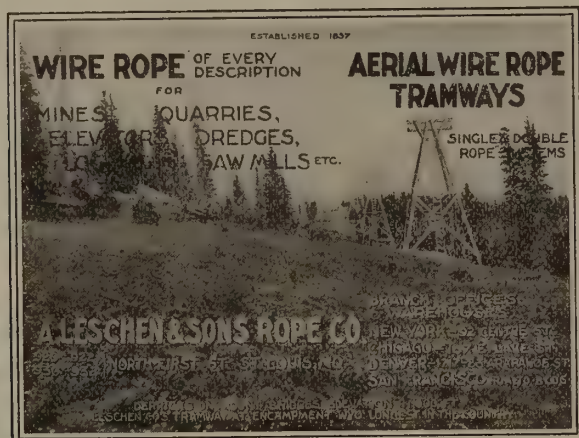
FOR SALE

**SILVER AMBER MICA PROPERTY**

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

**F. E. LEUSHNER,**

Room 12, Janes Bld., TORONTO, Canada.



Are You Confronted with a  
Difficult Ore-Separating Problem?

**THE WETHERILL MAGNETIC SEPARATING PROCESS**

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO., 52 Broadway, New York**Manufacturing Agents for Canada, **ROBERT GARDNER & SON, Montreal, P.Q.****Canada Atlantic Ry.**THE SHORT FAVORITE ROUTE  
BETWEEN**Ottawa and Montreal.****4 TRAINS DAILY 4**  
EXCEPT SUNDAY

And Sunday Train Both Directions

**PULLMAN BUFFET PARLOR CARS**

Close Connections at Montreal with Trains for

**Quebec, Halifax, Portland**

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

**Ottawa, New York and Boston**

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.**E. J. CHAMBERLIN,**  
General Manager.**C. J. SMITH,**  
Gen. Traffic Manager.**W. P. HINTON,**  
Gen'l Passenger Agent.**J. E. WALSH,**  
Ass. Gen. Passenger Agt.**EIGHTH MONTHLY DIVIDEND, Feb. 15th**

WILL BE PAID BY THE

**California-Nevada Mining Co.****60% PER ANNUM GUARANTEED**

on Par Value of Stock when Mill is completed.

**PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.**

**\$20,000,000 BLOCKED OUT** A 200-TON PER DAY PLANT  
READY FOR THE MILL, and the CONTRACTED FOR and will be  
Hoodlum Claim, which adjoins the in full operation not later than  
Old Victor Mine, yet to figure on. April 1st, 1903.

**PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.**

Do not fail to investigate this proposition, for the more you investigate the more stock you will want. Write for prospectus.

**W. H. BALDWIN & CO., Brokers and Financial Agents** 49-50-51-52 VOLCKERT BLDG., ALBANY, N.Y.

REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company, Los Angeles, Cal.; any mining journal of the state or prominent mining men.

**Canadian Mining Institute**

INCORPORATED BY ACT OF PARLIAMENT 1898

**AIMS AND OBJECTS.**

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

**MEMBERSHIP.**

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

**SUBSCRIPTION.**

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

**PUBLICATIONS.**

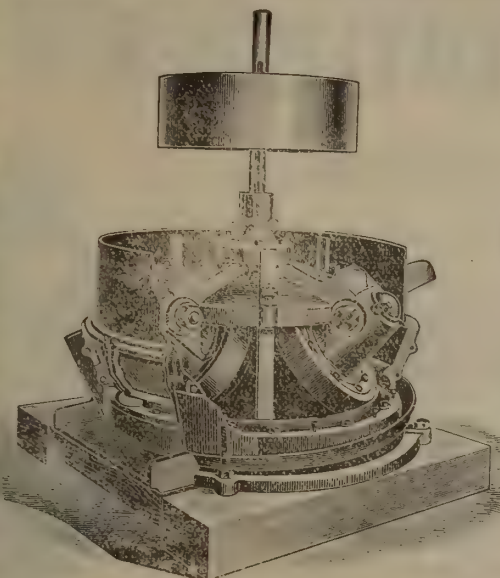
Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

**B. T. A. BELL, Secretary,**  
Orme's Hall, Ottawa





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

**A FEW**

ITEMS FROM OUR STOCK OF  
SPECIAL INTEREST TO MINE  
OWNERS AND OPERATORS...

**W. H. C. Mussen & Co.**

MONTREAL

**ATLAS CAR MOVERS**

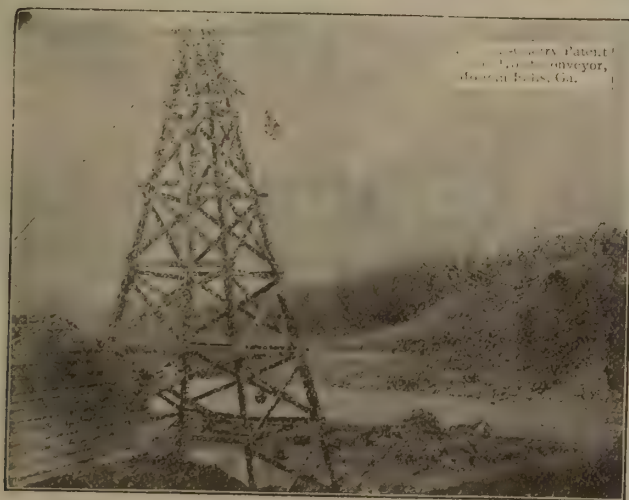
**NORTON BALL BEARING JACKS**

**WIRE ROPE AND FITTINGS**

**LIGHT MINE RAILS AND PLATES**

**OCTAGON DRILL STEEL**

# Cable Hoist-Conveyors



MANUFACTURED BY

**THE TRENTON IRON CO.**

TRENTON, N. J.

Engineers and Contractors, and sole licensees in North America for the Bleichert System.

Also, Wire Rope Equipments for Surface and Underground Haulage.

Illustrated book upon application.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.  
Chicago Office—1114 Monadnock Building.

## WANTED

Vols. I and II General Mining  
Association of Quebec.

Vol. I Ontario Mining Institute.

Vols. I, II and III Federated  
Canadian Mining Institute.

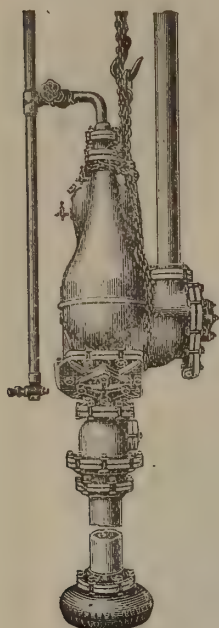
Vols. I, II, III and IV Canadian  
Mining Institute.

**\$20** WILL be paid for a complete  
set of these volumes. Readers  
having any, or all, of these copies for  
sale please write to

**The Canadian Mining Review**

OTTAWA, Canada.





# The Pulsometer.

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

NOISELESS. NOT AFFECTED BY WEATHER.

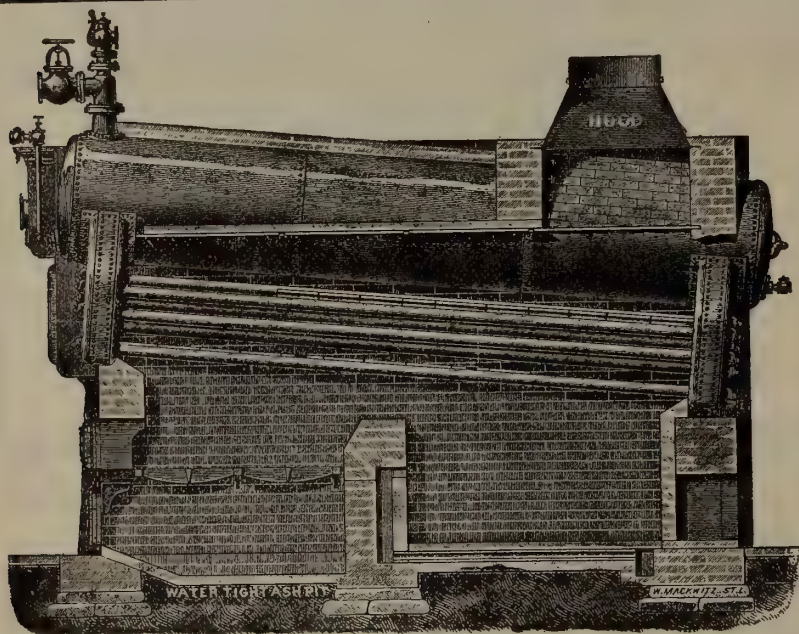
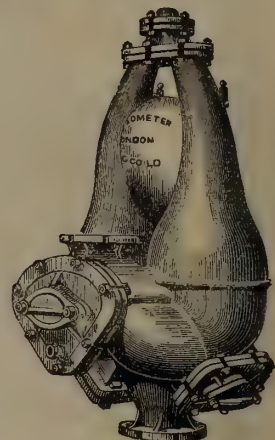
NO SKILLED LABOR REQUIRED.

MOST ECONOMICAL AND BEST MADE.

NO EXHAUST STEAM. SIMPLE. DURABLE.

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL

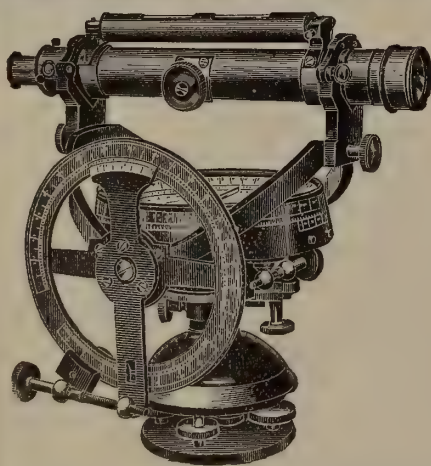


## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

Head Office : 107 ST. JAMES STREET, MONTREAL

Address : P. O. BOX 396.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

### ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\*; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction or 100; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,

PARLIAMENT BUILDINGS, QUEBEC, P. Q.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**  
Commissioner Public Works and Mines,  
HALIFAX, NOVA SCOTIA.





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

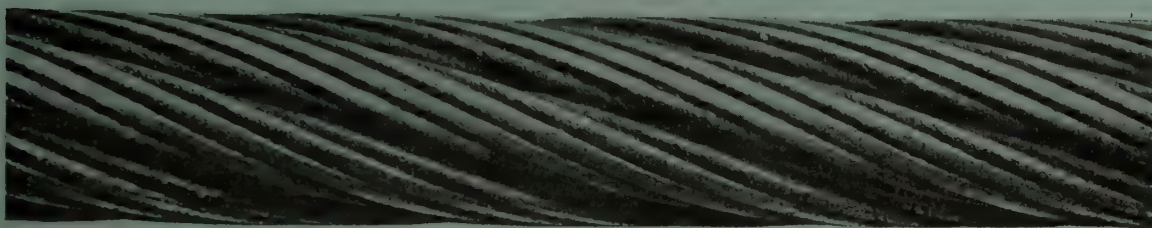
## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

Illustration of Winding  
Rope, 240 fms. long x  
3½ circ. Galvanized  
Special Improved  
Patent Steel, Com-  
pound Make, supplied



to Kenneil Collieries,  
Bo'ness, Scot., which  
gave a record life of 6  
years and 2 months.  
Shewing condition  
when taken off.

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

AGENTS IN CANADA :

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

# Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steal Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

Montreal Pipe Foundry Co. Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

"LUDLOW" VALVES & HYDRANTS

GENERAL OFFICES:

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

CANADA IRON FURNACE COMPANY, LIMITED

Plants at: RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

CANADA LIFE BUILDING, MONTREAL.

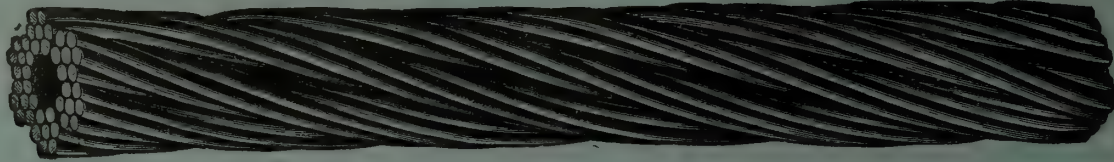
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

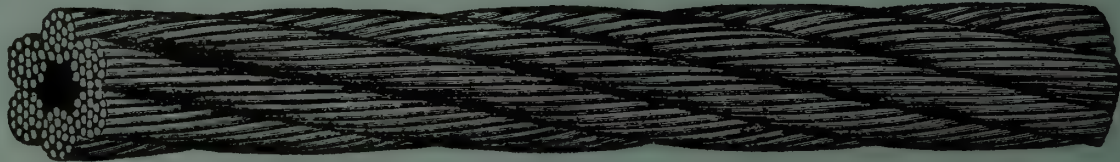
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

**SOMETHING  
NEW...**



**SOMETHING  
TO LAST...**

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

**UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES**

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont. CATALOGUE ON  
Halifax, N.S. APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

**LIGHT MINING RAILS**

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**ORE  
AND  
..Mining Cars..**

**WHEELBARROWS ALL  
KINDS**

**SPECIAL ORE BARROWS  
Charging Barrows**

**PICKS, SHOVELS, HAMMERS, TOOLS, ETC.**

**Barrett Jacks.**

**Car Movers.**

**ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...**

**JAMES COOPER**

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. X.

OTTAWA, OCTOBER 31st, 1903.

Vol. XXII—No. X.



**AIR  
COMPRESSORS  
GAS**

**THE CANADIAN RAND DRILL CO**  
**SHERBROOKE, QUE.**  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



**ROCK  
DRILLS**



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

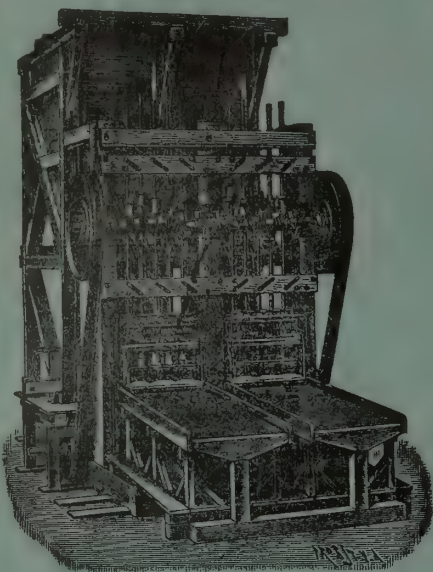
ROSSLAND, P.O. Building.



# FRIED. KRUPP AKTIENGESellschaft GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 549, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West  
Opposite Queen's Hotel TORONTO, ONT.

## MINING EQUIPMENT, Etc.

## Modern Mining Machinery

We have all the latest improvements in this class of machinery, and have a thoroughly up-to-date plant for the manufacture of same.

### The WILFLEY CONCENTRATOR

We are sole Canadian manufacturers of this famous Concentrating Table and have installed it in a great many of the largest plants in Canada.

We also build the **Samson** turbine water wheel which is peculiarly adapted for mining purposes.

Write for further information

The Wm. Hamilton Mnfg. Co. Limited  
Peterborough, Ont.



# Baldwin=Westinghouse

## Electric Locomotives for Mine Haulage



100 H.P. Electric Locomotive Hauling Coal Train to Tipple.

There are mines where, by their use, the cost of traction has been reduced from ten to one cent per ton, and the production doubled

Write either Company for Circular "B-W. 1000"

Westinghouse Electric and Mfg. Co.  
Pittsburg, Pa.

Baldwin Locomotive Works  
Philadelphia, Pa.

HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative of the Hadfield Steel Foundry Co., Ltd, Sheffield, for Canada

PEACOCK BROTHERS, Canada Life Building, MONTREAL.

## THOS. FIRTH & SONS, Ltd., Sheffield,

## Tool Steel and Rock Drill Steel

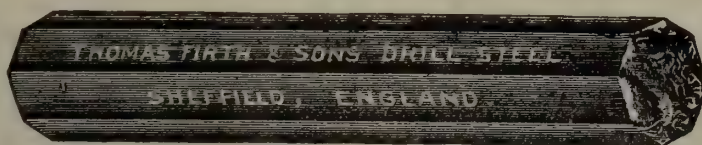
ALWAYS CARRIED IN STOCK.



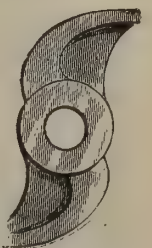
STAMP SHOES

STAMP DIES

SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



### H. W. DeCOURTENAY & CO.

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.



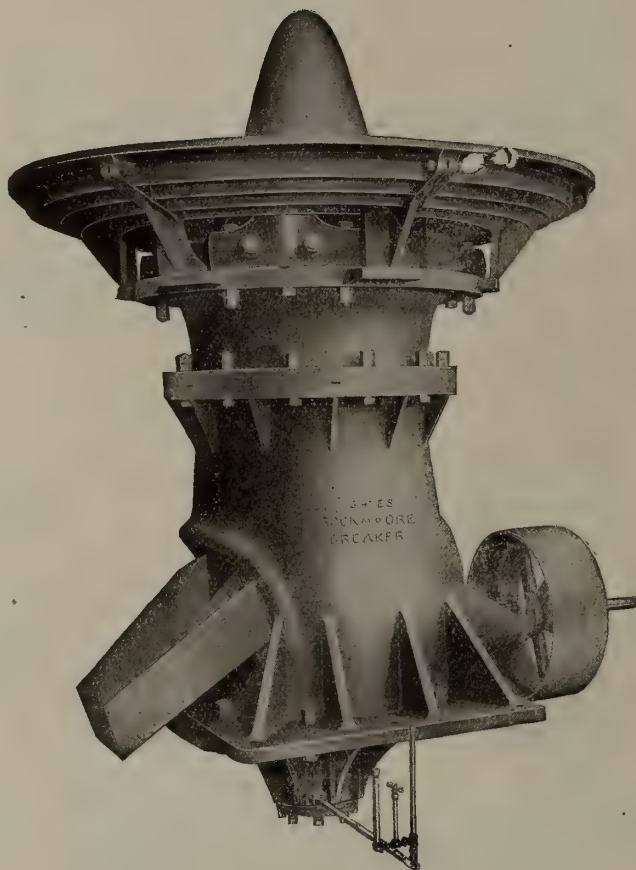
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'FG CO.,  
SCRANTON, PA.

SOLE BUILDERS OF

## Gates Rock and Ore Breakers



New Features  
IN  
Construction  
OF  
Great  
Importance  
TO  
Crusher Users  
SAVES **20** PER CENT

Complete Crushing Plants Designed and Equipped  
Our 25 Years' Experience is at Your Service

## BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

## GENERAL

CHICAGO,



LONDON, ENG., 533 Salisbury House

## OFFICE

ILL., U.S.A.

JOHANNESBURG, South Africa

## BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Heenan Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

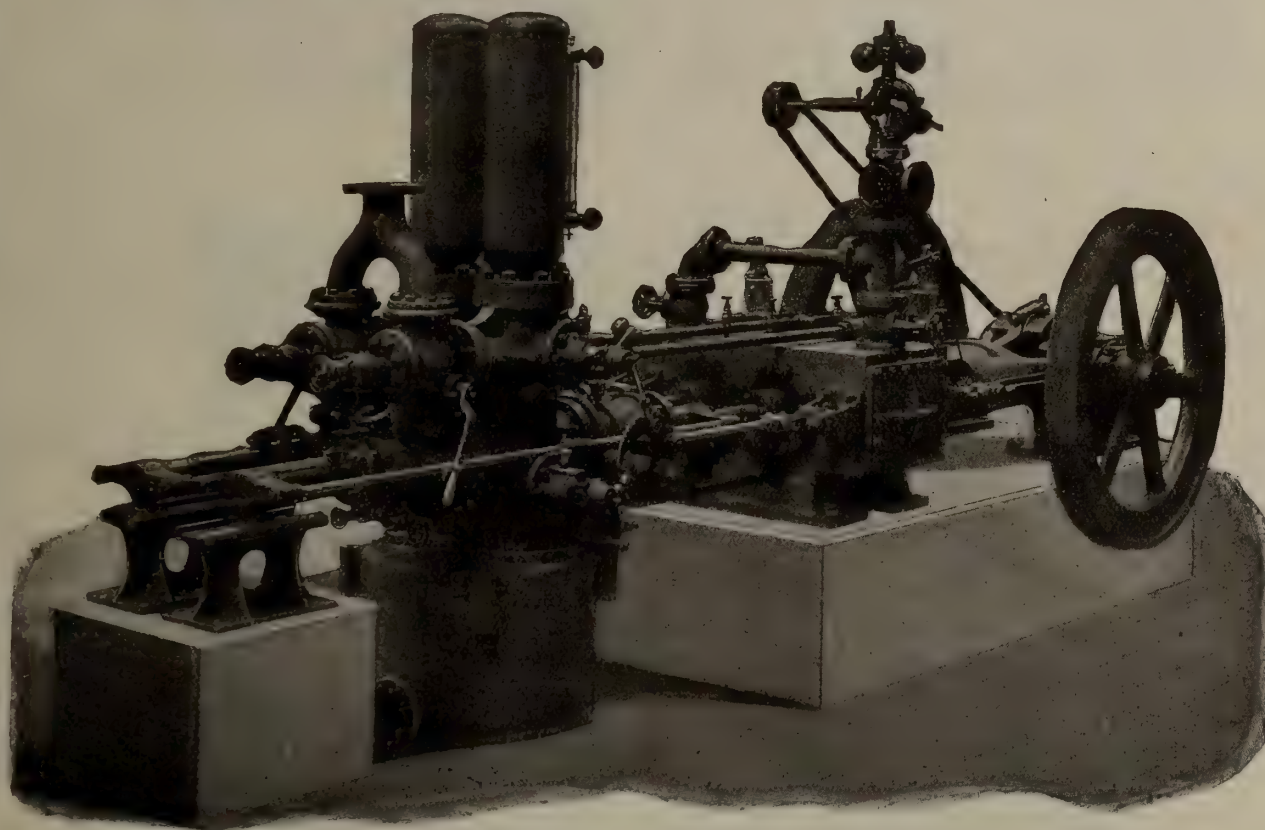
SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'FG CO.,  
SCRANTON, PA.

EXTENSIVE BUILDERS OF

## MINE PUMPS

We are sole builders of the Riedler positively controlled water valve pumping engine, and the Reynolds automatically operated water valve pumping engine.



DUPLEX DIFFERENTIAL RIEDLER PUMP

The above cut illustrates a duplex differential Riedler pump driven by a horizontal duplex slide valve engine. It is arranged to be run by compressed air and is capable of running submerged under a moderate depth of water. This engine was built for the Alaska United Gold Mining Co., Alaska, and has been doing excellent service since installed in 1896.

We have furnished upwards of thirty pumps of similar design to various mining companies, all of which are giving universal satisfaction.

Pumps of large capacity are built with compound Corliss Engines.

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

### GENERAL

## CHICAGO,



### OFFICE

## ILL., U.S.A.

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

### BRANCH OFFICES:

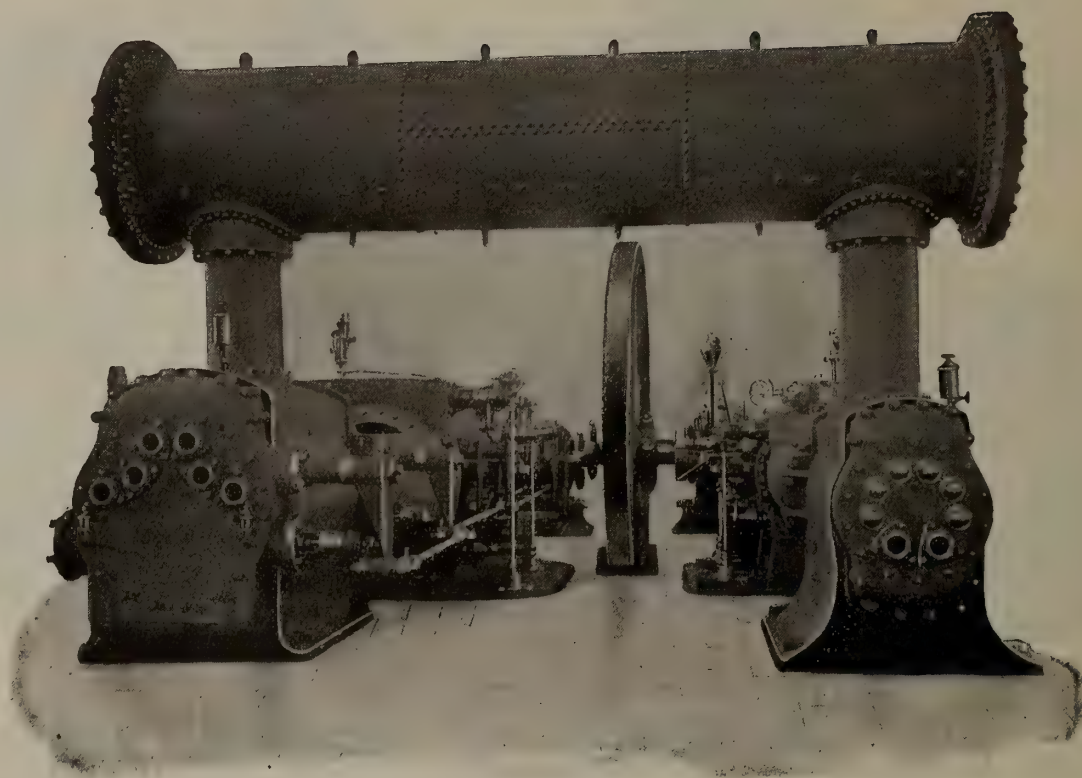
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO.

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RATPORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

MECHANICS SUPPLY CO., Quebec.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-  
ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.



# INGERSOLL-SERGEANT MACHINERY

Rock Drills  
Air Compressors  
Coal Cutters

The I-S COAL CUTTER

H 4



Is the most popular and extensively used  
COAL PUNCHER in NORTH AMERICA to-day.

It is easy on the operator, yet does the work. Light and strong.  
The economy of repairs is its recommendation with the superin-  
tendents, whilst economically it makes the most of every pound  
of pressure in the pipe line : : : : : :

BUILT FOR USE IN CANADA  
BY

## THE JAMES COOPER M'F'G CO. Limited

299 ST. JAMES STREET

MONTREAL, Que.

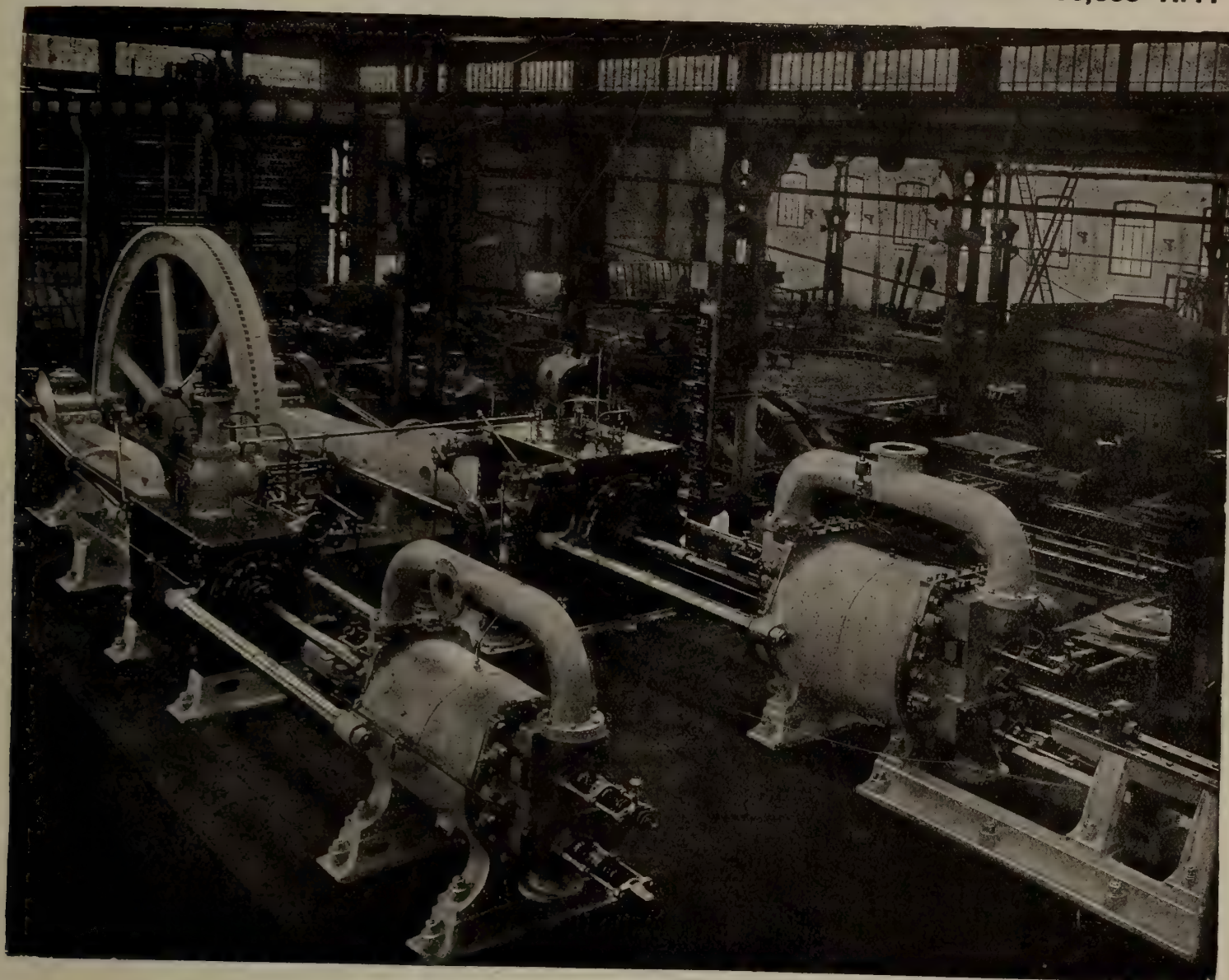


# WALKER BROTHERS

WIGAN, ENGLAND

## AIR COMPRESSORS

AGGREGATE POWER AT WORK, ABOUT 550 IN NUMBER, EXCEEDS 250,000 H. P.



WALKER BROTHERS HAVE RE-MODELLED OVER 100 AIR COMPRESSORS  
ORIGINALLY CONSTRUCTED BY OTHER MAKERS.

## RIO TINTO COMPANY

We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

### THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery:—

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIR,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) pro S. PEARSON & SON, E. W. MOIR.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

PEACOCK BROTHERS Representatives for Canada . . . 44 Canada Life Building, MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

.....WORKING MACHINERY

.....FOR.....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

### J. BASZANGER & CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

## CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

431-5 STOCK EXCHANGE BUILDING, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

**Steel Works and Head Office : NEW GLASGOW, N.S.**



# DIAMOND

## DEEP DRILLING

makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



### American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS

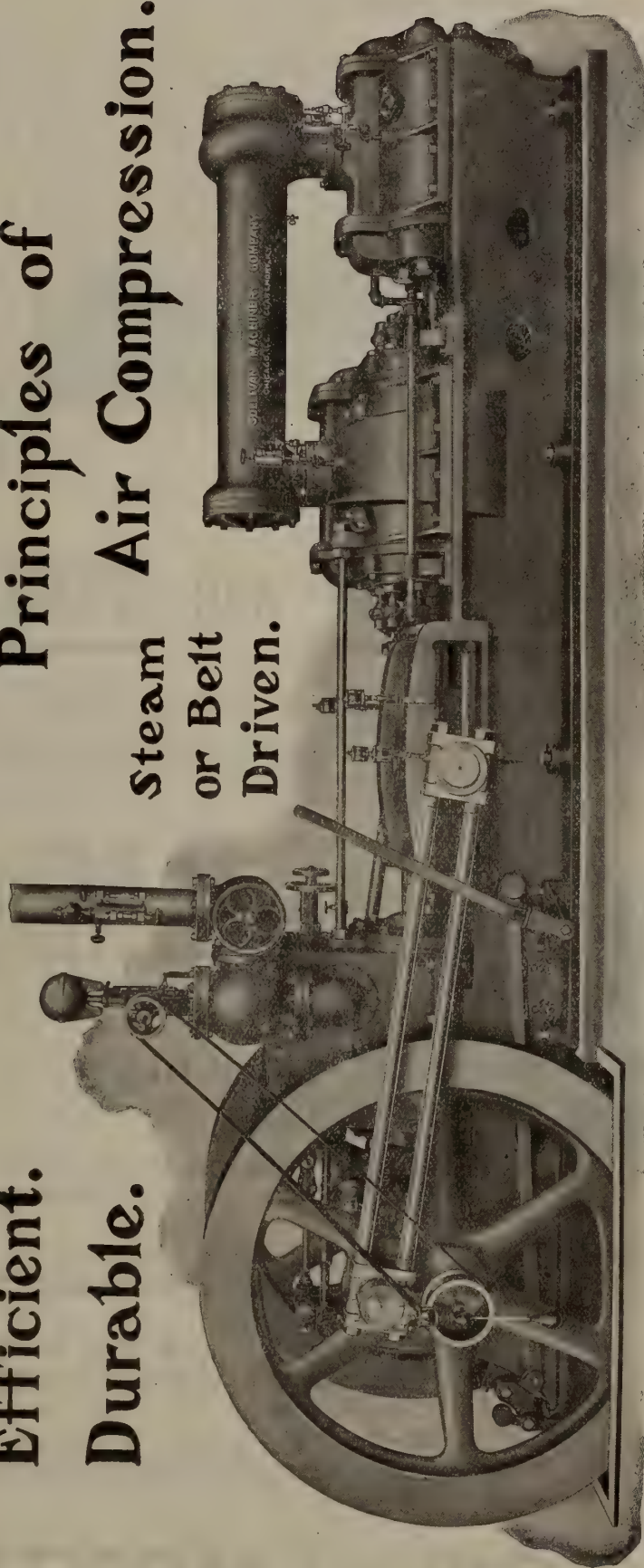


# Sullivan Straight Line Two Stage Compressors.

Simple.  
Efficient.  
Durable.

Embody the Best  
Principles of  
Air Compression.

Steam  
or Belt  
Driven.



**Sullivan**

**Machinery**

**Company.**

Claremont, N.H.  
New York.  
Pittsburg, Pa.

135 Adams St.

Chicago, Ill., U.S.A.

European Agency 25 Rue Raffet, Paris

St. Louis, Mo.  
Denver, Colo.  
El Paso, Tex.



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence

in Bituminous Coal and Coke

for Blast Furnaces, Foundries,

Manufacturing and Domestic

Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.

### Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,  
President.

CHARLES FERGIE,  
Vice-Pres. & General Manager.

D. FORBES ANGUS,  
Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention. By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.



# JEFFREY Coal Cutting Hauling Drilling Screening Crushing Dredging Elevating Conveying Coal Washing Power Transmission MACHINERY



BEST ROCK DRILL IN THE  
MARKET

Catalogue No. 72

Elevating-Conveying  
Machinery.

May we send you a copy?

## COAL CUTTERS

### ELECTRIC MINE LOCOMOTIVES

Catalogue No. 19 describing  
these is yours for the asking



We can elevate or convey your  
material—bulk or package, wet  
or dry, up, down, straight along,  
sidewise, any size, any distance



JEFFREY 16A ELECTRIC CHAIN COAL CUTTER.

— ADDRESS —

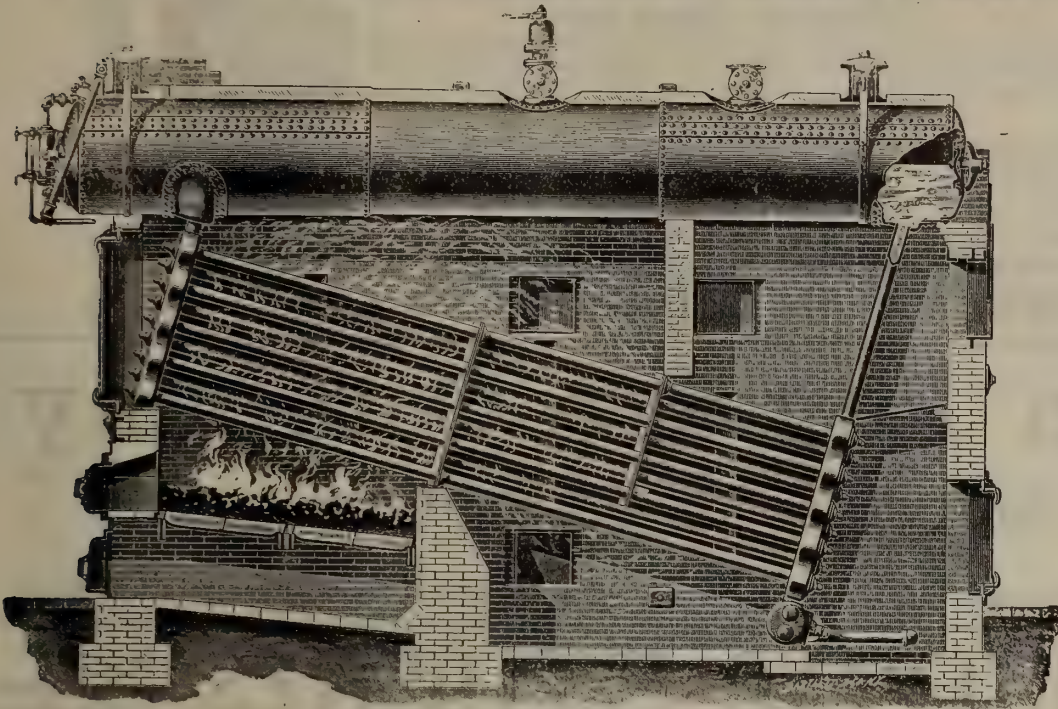
## THE JEFFREY MFG. CO., Columbus, Ohio, U.S.A.

Montreal Representatives—WILLIAMS & WATSON

Toronto Representatives—A. R. WILLIAMS MACHINERY CO.



# THE BABCOCK & WILCOX



## WATER TUBE STEAM... BOILER..

was first patented by Stephen Wilcox, in 1856. Over **3,000,000 H.P. now in use.** Has no equal for MINES, RAILWAY, SMELTERS, ELECTRIC LIGHTING or other power purposes.

Large book "STEAM" sent free on application.

**BABCOCK & WILCOX, LIMITED, ENGINEERS AND BUILDERS.**

HEAD OFFICE FOR CANADA:

NEW YORK LIFE INSURANCE COMPANY'S BUILDING, 11 PLACE D'ARMES, MONTREAL.

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York Filter Manufacturing Company



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.



SEND FOR  
CATALOGUE

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

## Hamilton Powder Company

### Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

## DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec. & Treas.

**ONTARIO POWDER CO. Limited**

115 BROCK STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works.

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings.

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P. Q.

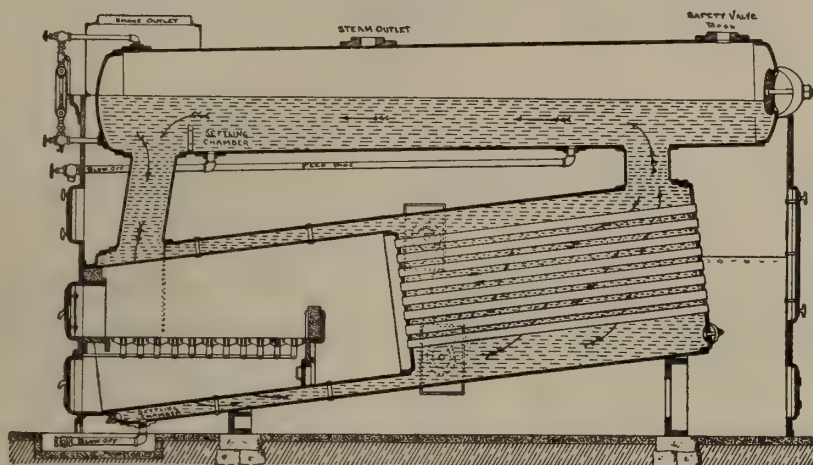
# MILL AND MINING MACHINERY

Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, Steam  
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron  
Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron **OTTAWA**  
..Works..



## Combines the Best Qualities of Other Boilers.



The Mumford Standard internally fired boiler combines to a remarkable extent the best features of the Scotch and English types of internally fired boilers, together with the lighter weight, less floor space and more perfect circulation of the best boilers of the American water tube type.

The construction throughout, except the tube sheets, is cylindrical and spherical, requiring no stays; the boiler is supplied with an outer steel casing or for brick setting as desired by the customer.

The steam and water space is divided between two cylindrical shells; the thickness of plate is not so great as in the Scotch marine type, and the expensive and troublesome rear combustion chamber is avoided.

### Robb Engineering Co. Limited

Amherst, N.S.

AGENTS : WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

WATSON JACK & COMPANY  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

#### 1. THREE YEARS' COURSE FOR A DIPLOMA IN

- (a) Mining Engineering.
- (b) Analytical Chemistry and Assaying.

#### 2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN

##### GROUP I.

- (a) Mining Engineering.
- (b) Chemistry and Mineralogy.
- (c) Mineralogy and Geology.
- (d) Chemical Engineering.

##### GROUP II.

- (e) Civil Engineering.
- (f) Mechanical Engineering.
- (g) Electrical Engineering.

##### GROUP III.

- (h) Biology and Public Health.

#### 3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY

for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

#### 4. POST-GRADUATE COURSE FOR THE DEGREE OF

Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

**Next Session begins  
Sept. 30th, 1903.**

**MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.**

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



# The Canadian Mining Manual

THIRTEENTH  
YEAR

## 1903

THIRTEENTH  
YEAR

BY

### B. T. A. BELL

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

A Complete  
Directory  
to all  
Canadian  
Collieries  
Blast Furnaces  
Mines  
Quarries  
Mills  
Smelters  
and  
Mineral  
Producers  
—  
Endorsed  
by the  
Canadian  
Mining  
Profession

Authentic  
Information  
Concerning  
their  
History  
Organization  
Capital  
Dividends  
Accounts  
Operations  
Statistics  
Plants  
Labour  
—  
Approved  
by the  
Mining  
Financial  
Press

This standard work of reference to Canadian Mining under-  
taking and active industries is

**NOW READY**

## **A COMPLETE MINING DIRECTORY**

### NEW FEATURES

Arranged Alphabetically, Classified by Industries  
and by Provinces  
For the Mine Manager, the Capitalist and the Manufacturer.

BOUND IN CLOTH.

PRICE FOUR DOLLARS.

**Subscribe  
for it.**

PUBLISHED BY  
**The Canadian Mining Review**  
OTTAWA, CANADA.

**Advertize  
in it.**



LOBNITZ GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

LOBNITZ & CO., LIMITED,  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.  
**GOLD DREDGERS.**  
ALL PARTS MADE TO GAUGE.  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., Ltd., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW Al Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

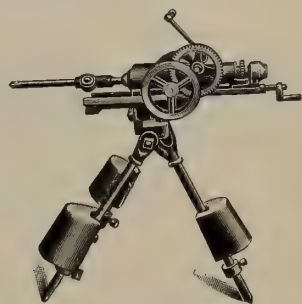
It Saves Steel,

It Saves Labor,

It Saves Money.



Write for Catalogue.



JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.

## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.

This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

# STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
Metals, Mattes, Etc.  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

Canadian Mining Manual and  
Mining Companies Year Book

1903

## NICKEL

The  
Canadian Copper  
Company

74 BROADWAY  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

74 BROADWAY  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and  
Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDOUX & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### PARMALEE & WELD

Successors to Pohle & Parmelee

ANALYTICAL CHEMISTS and ASSAYERS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical processes or patents.  
General Commercial analysis.  
Prices and sample sacks free on application.

P.O. Box 1421. 1755 Arapahoe St. Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538 Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING.  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc. (McGill)**

CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street MONTREAL

ASSAYS OF ORES.

CHEMICAL AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and, re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.PORT ARTHUR, ONT.  
CANADA.**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.8-KING STREET-8  
MANCHESTER, ENGLAND.**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. So.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

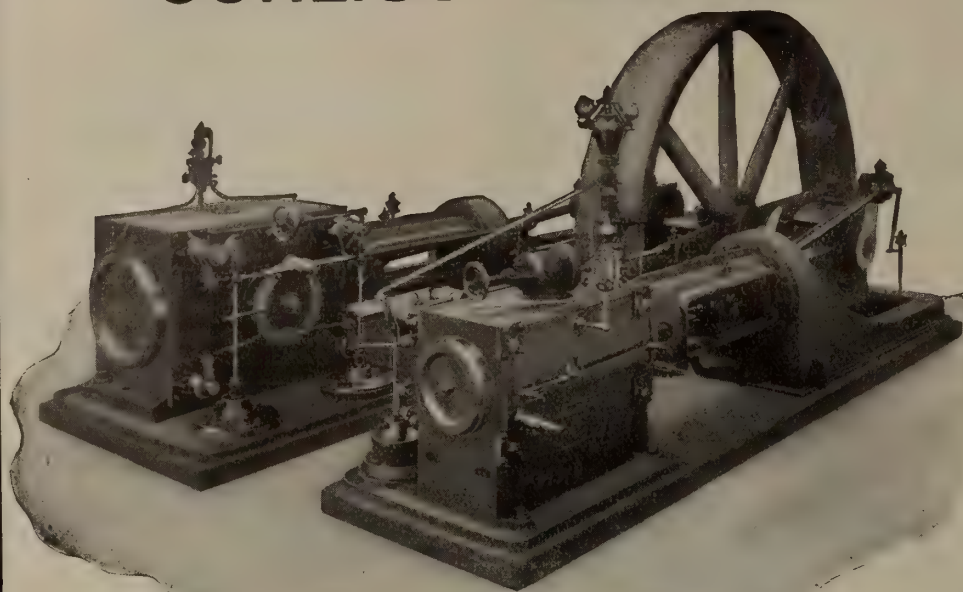
MECHANICAL ENGINEER

DREDGING MACHINERY. PLANT FOR PUBLIC WORKS. GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL  
CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

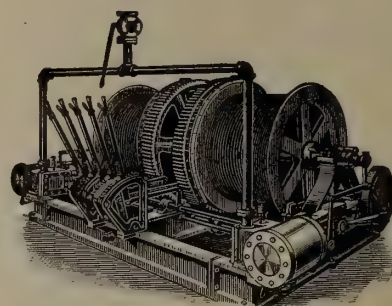
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels  
for Dredging, Dykeing, Ditching, GOLD  
MINING, Etc., of various Styles and  
Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



## Wire Screens

FOR EVERY CLASS OF MATERIAL.

Perforated Metal of Steel, Copper, Brass, Zinc, for all purposes.

Special attention given to Miners' Requirements

**The B. Greening Wire Co. Limited**

HAMILTON, ONT.

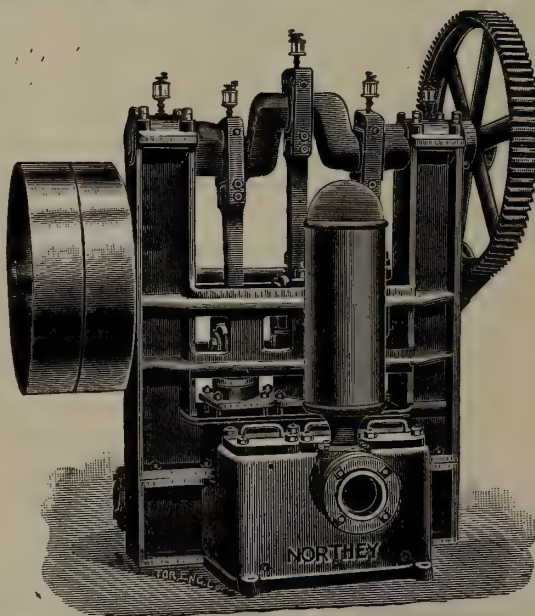
MONTREAL, QUE.

## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**THE NORTHEY CO.,**

**Limited, Toronto, Ont.**



# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES { Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 10.

OCTOBER, 1903.

VOL. XXII., No. 10.

## The Passing of Prosperity.

There are ominous signs on the business horizon, at any rate on that of the United States—signs of a coming storm. The prosperity that has been rampant for a number of years seems to be drawing to an end, and the long-postponed but inevitable reaction is setting in.

Economists are agreed that the industrial system of to-day rests upon a basis of pig iron. If the iron trade is in good condition, other trades are likely to be prosperous; it is a barometer responding promptly to the rising demand of good times, and promptly showing the recession when the flush of activity is past. In October 1902 No. 2 foundry pig iron sold in Philadelphia at \$22 per ton; in October 1903 it is being sold at \$15.25 per ton, a reduction of 30 per cent. In the Cincinnati market the fall has been even more pronounced. The cause of the decrease is simply the smaller demand. Consumption has measurably overtaken production, and there is a movement among producers to restrict the output. Those furnaces whose margins over the cost of production has disappeared or is disappearing are being blown out. The demand for iron ore is also lessening. The quantity of ore shipped from the Lake Superior district of the United States will be considerably smaller this year than last, and is not expected to exceed 25,000,000 tons. As yet manufactured steel has not shown a corresponding reduction in value, steel rails being quoted at the same price as in October 1902, viz., \$28 per ton, and steel billets, having fallen from \$29 to \$27 per ton. But there is no mistaking the tendency of the markets, which is decidedly downward, and favorable to a further diminution of the production.

The United States Steel Corporation reduced its quarterly dividend on the common stock, payable in October, from one per cent to one-half of one per cent, the earnings of the company having fallen from \$11,930,846 in September 1902 to \$9,000,000 in September 1903, for the quarter ending in September from \$36,945,489 in 1902 to \$32,302,821 in 1903, and for the nine months from \$101,142,158 in 1902 to \$94,013,836 in 1903. This reduction in the dividend has been followed by a heavy fall in the selling value of the stock, common now being quoted at \$12.50 per \$100 share. The public has always been nervous about U. S. Steel stock, the general conviction being that it carried a great deal of water.

Coal and coke, bound up as they are with iron, exhibit a sympathetic downward tendency. The demand for bituminous coal has slackened, and prices are going down. The scarcity of coke which has been a marked feature of smelting and manufacturing operations for two or three years is likely to come to an end. The situation in anthracite contrasts strangely with that of a year ago. Then hard coal

was not to be had at any price, now dealers everywhere are well stocked, and the collieries are running on short time.

Labor troubles have done much to cause uneasiness and are still disturbing the situation. The high wages which have been the rule for a long time seem destined to suffer a reduction, as in the iron mines of Alabama, where the miners have had to submit to a cut varying from 2½ cents to 5 cents per ton, the cause alleged being the fall in value of pig iron. Railway companies are discharging men, but notwithstanding this there are rumors of strikes among the employees of other lines.

The course of the stock market in New York and elsewhere has been sufficiently alarming. Shares have been tumbling until it seemed as if there were no bottom, and the end is not yet. The great industrial combines whose proportions startled the world when formed are entering upon a period of trial, and already some of them are showing intrinsic weakness, the outcome of inflated valuations. A business which in times of high prices and active demand can easily earn money enough to pay 6 per cent on a capital of \$100,000,000 representing say \$50,000,000 of real assets, may be hard put to it to do more than defray expenses when prices are cut in two and goods have to be forced to a sale. The next few years will undoubtedly be a time of sifting among these enormous aggregations of business and capital.

While this has been the course of events in the United States, what is the outlook for Canada? In past years we have been vitally affected by conditions south of the line, and good or bad times prevailed here concurrently with there. This state of affairs yet obtains to some extent, but notwithstanding the large increase of Canadian trade with the United States, this country is more independent of her neighbor in matters of commerce than ever before. Canada buys largely in the States, and sells largely to Great Britain. A country's ability to sell does not suffer so much in a time of depression as its ability to purchase, hence Canada may continue to buy to advantage south of the line and sell to advantage across the water despite the coming of hard times to the great republic.

The causes, however, which have produced evil effects in the United States have been at work here. A striking case in point is the Lake Superior Consolidated Company, whose affairs at Sault Ste. Marie have reached a crisis. The preferred stock of this company, amounting to \$28,000,000, sold at one time for 80, now it stands at 2½, while common stock of which there is \$74,000,000 has fallen from 36 to a quarter of a cent or less. That a company with a nominal capital of \$102,000,000, owning its own mines, blast furnaces, railways, steamers, pulp mills, steel works, water-powers, and saw-mills, and huge grants of land, should come to such a pass as to permit its effects to go to



the hammer for lack of funds to pay off a mortgage of \$5,000,000, seems almost incredible. Yet this is what has taken place, and the law has placed the mortgagee in possession. The Dominion Coal Company and the Dominion Steel Company are additional instances, but perhaps not so pronounced, of heavy losses following upon bad management.

Yet making due allowance for these failures, the situation in Canada comprises elements which may well go to mitigate the severity of a financial depression, should one be in store for this country, if not to avert it altogether. Immigration is adding to the population by leaps and bounds, and during the present year the incoming tide has been fuller than ever. The fertile plains of the Northwest are being rapidly occupied and brought under cultivation. In Ontario the government railway from North Bay to Lake Temiskaming and northward, and in the Dominion the Grand Trunk Pacific will render accessible large tracts of good farming land, great forests of timber, areas of ranching ground, and deposits of minerals. In addition they are causing and will cause the expenditure of large sums of money in the work of railway construction. This year's harvests were abundant in some parts of the Dominion and good in all, and are bringing high prices. All these causes cannot but contribute to a prolongation of good times in Canada, without reference to the turn events may take in the United States.

There is some recompense for the shabby way in which this country has always been treated in trade matters by the United States in the fact that Canada is more self-contained and less dependent upon her great neighbor than if the commercial relations of the two countries were more intimate, and that she is consequently better able to withstand the crisis which appears to be gathering in the south of us.

### A Danger Ahead

Notwithstanding that the proposal to re-organize the Dominion Geological Survey has been under consideration for three years or more no particulars are as yet forthcoming concerning the scheme which is to be adopted. The Minister of the Interior has announced his intention of separating what he calls the "economic" work of the survey from the "scientific" work, and of giving the former much more prominence in the future than it has enjoyed in the past. It seems to be his idea to establish a distinct branch of his department to deal with the industrial side of the mining business, leaving the remnant of the survey to continue the geological mapping of the country, and either to place the two branches under different deputy ministers or assistants, or to subordinate the geological and "scientific" functions of the department to the "economic" placing the management of the survey or whatever the transformed branch may be called, in the hands of the "economic" chief.

In our way of thinking the attempt to divorce the practical from the so-called scientific aspects of the geological survey is doomed to failure. The fact is, the work of the survey is, or should be, wholly and entirely practical, and among the most practical of its duties is the working out and recording in reports and maps the geological formations of the country. Time and again in the history not only of the Canadian Geological Survey, but in that of similar institutions in other countries, investigations carried on and results achieved which had little or no economic value at the time have later on proven most fruitful in dollars and cents. An instance occurs to us of the usefulness of work done primarily for scientific purposes. In 1887 an examination was made of the Rainy Lake region of Ontario by Dr. A. C. Lawson, who thoroughly worked out and mapped the geology and topography of the district. A few years later gold was discovered in the territory covered by Dr. Lawson's survey, and the map accompanying his report

which had lain in the Survey's archives came suddenly into demand, for prospectors found that they could travel almost anywhere by its guidance with the added advantage of having the rock formations plainly and accurately delineated.

But if we mistake not, Mr. Sifton will encounter other and greater difficulties in the attempt to cover the mining industry of the whole of Canada than those offered by problems of internal administration. In not a few of the Provinces of the Dominion the local governments have established bureaux or departments for the express purpose of promoting the interests of mining within the Provincial boundaries. In British Columbia, Ontario, Nova Scotia and Quebec these organizations have been in existence many years, and have done valuable work, quite as useful and important in its way as any done or likely to be done by the Geological Survey.

The Provinces, or at any rate the older Provinces, own the Crown lands yet unsold within their limits, which in the case of Quebec and Ontario comprise the greater part of their area. Being in the position of proprietors of the land, it is naturally in the interest of the Provinces to explore their unsettled areas, and to systematically make known their mineral and other resources. One end served by such action is to promote settlement in the new districts, and another is to increase receipts from the sale of wild lands.

Again, the duty of making laws for the government of the mining industry is by the constitution of Canada relegated to the Provincial Legislatures, who frame such measures as they deem the circumstances of the Province require. It is quite conceivable that the views entertained by the Government of any one of the Provinces, say British Columbia or Ontario, on any matter connected with mining might be very different from those held by the Dominion Government of the day. In a clash of this kind, the cry of Provincial rights would certainly be raised, and the interests of legitimate mining would suffer, as in the past they often have suffered, in the clash of party politics. In Nova Scotia, coal, and in Ontario, nickel, have been the subjects of special Provincial legislation. Whether the action of the Legislatures in these cases was wise or the reverse, it was the action of competent authority, and was no doubt taken on the advice of the mining departments of the respective Provinces. It is exceedingly doubtful that the Provincial authorities will tamely acquiesce in any abridgment of their rights or curtailment of their jurisdiction.

The proposal to include the whole of the mining industry in Canada in the scope of the revised Geological Survey will almost inevitably lead to the duplication of work and expense. The Dominion and Provincial Governments will be covering the same ground, and public money will be thrown away. Nor will the trouble end here. Independent reports will be issued by the respective governments on identical fields or subjects, and as geologists and mining experts are notoriously apt to disagree, differing or directly contrary views will be given to the world on official authority regarding the objects of investigation. Such a state of things can only have the effect of discrediting one or both of the organizations, and of reducing the usefulness of both to the vanishing point. As the Dominion Government will be the invading party, the blame will naturally and rightly fall upon it.

It is possible some rational division of work might be made as between Provincial and Federal mining or survey departments, which would result in co-operation rather than confusion. The indispensable work of defining the geology of the country might well remain with the Dominion survey, as well as the extensive field for industrial investigation afforded by the Northwest Territories. Mining statistics for Canada as a whole might also be collected and published by the Dominion authorities. But any scheme of collaboration can only be



TREADGOLD ROYAL COMMISSION

1903.



JOHN AGNEW,  
Court Stenographer.

G. A. LACOMBE, M.D., M.P.P.,  
French Secretary.

THE HON. BYRON MOFFATT BRITTON,  
Commissioner.

H. H. ROWATT,  
English Secretary.

B. T. A. BELL,  
Commissioner.



arrived at after consultation with the Provincial authorities, and so far we have not heard that anything of the kind has taken place. The Dominion Government appears to be bent upon taking over the work of the Provincial mining departments and of putting the latter out of business, notwithstanding the excellent service which they have rendered and are continuing to render. This end will not be gained without much trouble, and it is doubtful whether it would be an improvement on the present condition of affairs.

Since the above was written an appropriation of \$10,000 has been made by the Dominion Parliament to cover salaries and expenses for the mining bureau to be established in connection with the Department of the Interior. Sir Wilfrid Laurier, in explaining the item, said it was intended to form a bureau similar to that at Washington, and for the present to confine the staff to two or three experts under the superintendence of Dr. Eugene Haanel. The duties of the bureau would be to collect and publish statistics and information regarding mining operations, and the mineral resources of the country, processes employed, and the production, consumption, imports and exports of economic minerals and products. The sum of \$5,000 has also been provided for metallurgical assistance to the Geological Survey, Mr. O'Connor having been appointed metallurgist.

The working out of the proposed arrangements will be watched with interest. It is difficult to see how the new bureau can operate to any purpose without infringing on the domain of the Provincial organizations.

#### Manganese in Nova Scotia.

In view of the constant demand for manganese it may not be out of place to recapitulate briefly the localities in this Province yielding its ores.

The most common ore is wad or bog manganese. This occurs at Jeddore, Ship Harbor, St. Margaret Bay, Chester, Springhill, Londonderry, etc. At Boularderie Island a deposit said to be several feet thick contains from 11.00 to 44.33 per cent of peroxide.

Pyrolusite is the only ore that has been mined to any extent in Nova Scotia. It occurs in carboniferous and pre-carboniferous strata. In the gold districts it has been noticed in veinlets penetrating granite and slates. In the rear of Wolfville it is found in slates referred to the upper silurian age. The lower carboniferous limestones also contain pyrolusite. So much is this noticeable at a certain horizon that the late Sir William Dawson proposed to subdivide the lowest limestone division by distinguishing a certain manganiferous limestone. This subdivision he recognised at Salmon River, Cape Breton Co., Springville and New Laing, Pictou Co., and at Chester, Fenny Cape, Maitland, Windsor, and Onslow.

These limestones carry in the rock manganese carbonates from traces up to 14.58 per cent.

In the northern part of Hants County the presence of this division is recognised near the mouth of the Shubenacadie river where a dark colored manganiferous limestone is associated with red shales carrying veins of red hematite with manganese oxides and calc spar.

The westward continuation is noticed at Tenny Cape, Walton, and Cheverie. These limestones carrying manganese ores outcrop again about fifteen miles to the south.

The Tenny Cape manganese ores were discovered about the year 1862 and have been worked intermittently since that date. Here it is found in limestone in irregular pockets, and in seams eroded on the bedding planes and cross fractures. Masses up to 180 tons in weight have been found. Usually, however, the pockets are small and connected by stringers. The ore is chiefly a fibrous pyrolusite, lustrous,

and bedded on compact pyrolusite, psilomelane, and manganite. After hand dressing these ores have brought \$125.00 a ton.

The high grade of these ores and their freedom from iron will appear when it is found that numerous assays show it to yield from 88 to 95 per cent of available oxide, with traces of iron, silica and moisture.

At Walton and Cheverie manganite is more common than at Tenny Cape. An analysis of the Cheverie manganite gave

|                       |       |
|-----------------------|-------|
| Manganese oxides..... | 86.81 |
| Iron peroxide } ..... | 2.05  |
| Baryta } .....        |       |
| Silica .....          | 1.14  |
| Phosphoric acid.....  | —     |
| Water .....           | 10.00 |
| Available oxygen..... | 47.73 |

It is believed that if a system of systematic quarrying and washing were adopted, many of the more highly mineralized belts would yield good returns.

Apparently this locality could be worked by quarry work, crushing and washing. Considerable quantities of psilomelane with manganite occur with limonite ore at the Steel Company's mines at Springville, associated with the manganiferous limestones. Manganese is also present in the iron ores up to 14 per cent.

In Cape Breton County, near the head waters of the Salmon river, a fine-grained pyrolusite occurs at several points. At one point it occurs as a bed, underlying a black manganiferous limestone, the two together varying in thickness from two to twelve inches. At another point it occurs in irregular bedded layers in a coarse reddish shale. The ore runs, according to the analysis of the Canadian Geological Survey, from 70 to 90 per cent of binoxide, and is free from iron or other impurity.

The system of following the irregular courses and stringers of ore hitherto followed, is too expensive to permit of profit. Judging from the extensive district known to contain ore and the abundance of surface indications it is probable that this part of Hants County would repay investigation.

In similar limestones at Minudie, in Cumberland County, soft fine-grained pyrolusite occurs, containing 97.04 per cent of binoxide.

Ores similar to those of Tenny Cape occur at Onslow and on the Salmon river, near Truro. Here red sandstones and shales and beds of dark colored limestone carry narrow veins and irregular nests and layers of ore. Some of the ore runs up to 90 per cent of available oxide. The ore also occurs in nodules in the soil.

On the College grant, Lunenburg County, some prospecting has been done on veins of manganese ore, which show over a large tract of ground. The country rock is reported to be a granite, carrying the ore veins varying in thickness from four to forty inches. Several hundred tons have been mined and exported, but as there is a long haulage to water, operations were suspended. Recent railway construction in this locality will, however, permit of a lessened cost of transportation.

The ores run from 85 to 90 per cent of binoxide, two-tenths to one-half per cent of iron, and from one to two per cent of silica.

This locality is believed to present the most promising field for exploration in the Province. Some of the veins are said to carry about 30 per cent each of iron and manganese, and to be large enough for cheap mining. From these notes it will appear that the ores of manganese are widespread in Nova Scotia, and that at several localities they are met over considerable areas. They have as yet however received little attention. There is good reason to believe that further search may show deposits large, if lower in grade, that can be mined in quantity for the purposes of the steel market.



**Gold Milling Costs.**

By S. HORSLEY, Mining Engineer and Inspector of Mines.\*

The difficulties in the way of a proper comparison of the total cost of extraction on the various goldfields of the world are:—

- 1st. The nature of the power used—e.g., water power is much cheaper than the most effectively applied steam power. If steam power is used, the relative cost of fuel must be taken into consideration. Extraction is much less costly where coal is obtained easily and cheaply than where indifferent firewood costs 30s. per cord.
- 2nd The nature of the material to be crushed. Hard material is not so easily crushed as a soft or friable material. A customs battery putting through 4 tons per stamp per day for one mine finds itself unable to put through more than 2 tons per stamp for another mine. Here the nature of the material causes one mine to pay twice as much for crushing as another mine.
- 3rd. The number of operations or processes necessary for a complete extraction.

Where coarse gold only occurs in an easily pounded quartz in close proximity to ample water power, the cheapest conditions possible for almost complete extraction are realised. But the case is exactly reversed where gold occurs in minute particles locked up in or combined with other substances which are hard and resisting, and which occur in waterless areas, where inferior fuel costs 30c. per cord.

Under favourable conditions, such as the occurrence of large deposits, requiring an extensive milling plant, the total cost of extraction might be as low as 9d. per ton in the former case. Yet the most efficient machinery combined with the most approved methods of treatment have failed to bring down the total cost of extraction so low as 10s. per ton, or 13 times as much in the latter case.

The way out of the difficulty is now apparent. Since the total cost of extraction necessarily varies so largely, we are unable to derive any useful information from a comparison. A great deal can be learnt, however, if, after the hardness of the material has been defined according to some pre-arranged standard, the cost of fuel per indicated horse power per ton and the cost of each separate operation or process is separately recorded.

It is also natural to expect a battery of 100 heads to crush more cheaply than one of 10 heads. But a company which finds 10 heads a sufficient number to erect on their mine cannot be said to lack economy. Although an examination of the costs of extraction by the various gold milling plants of the world reveals a wide divergence, yet the divergence is not so marked when the cost of each separate process is considered.

At Chiapas, Mexico, the cost of milling the soft ore there is only 9¾d. per ton of 2,000 lbs., with a 10 head battery having 750 lb. stamps. The cost of the power is not taken into account, as water power is used. The Alaska-Treadwell Company, Douglas Island, Alaska, with 540 stamps, crushed and concentrated for 9¾d. per ton in 1900. This company's costs for total extraction—milling, concentration, chlorination, smelting, and office expenses, were:—

| Year Ending         | Quantity Treated | Value per Ton | Cost of Total Extraction. |
|---------------------|------------------|---------------|---------------------------|
|                     | Tons             | s. d.         | s. d.                     |
| 31st May, 1899..... | 250,408          | 10 10         | 2 1                       |
| 31st May, 1900..... | 557,960          | 8 4           | 1 6¾                      |
| 31st May, 1901..... | 457,802          | 8 3           | 1 5½                      |

\* Queensland Mining Journal.

Their total costs for mining and milling for the same periods were 5s. 1½d., 3s. 7½d., and 4s. 4d. per ton respectively.

The Alaska-Mexican Company, at the same place, with 120 stamps, crushed and concentrated for 1s. 2d. per ton in 1899. They put through during 1899, 166,054 tons, valued at 8s. 7¼d. per ton, for a total cost for mining and milling of 7s. 1d. per ton. The total extraction costs were 1s. 11½d. per ton of 2,000 lbs.

The Homestake Company, South Dakota, U.S.A., crushed nearly 900,000 tons for the year ending June 30th, 1900. The total milling costs were 3s. 4d. per ton, and the total mining costs 10s. 9d. per ton—a grand total of 14s. 1d. per ton. For the year ending June 30th, 1901, the Homestake Company mined and milled 934,373 tons, valued at about 16s. per ton for a total cost of 14s. 8d. per ton, thus making a profit of nearly £63,000 sterling out of ore of a quality that is practically despised in Queensland. There are large deposits of low grade ore, similar in character and value to that mined by the Homestake, and superior to that mined by the Alaskan companies, in parts of Queensland as yet barely touched by the miner.

The milling costs of the De Lamar Mining Company, Idaho, U. S. A., for year ending 31st March, 1899, were 9s. 3¾d. per short ton.

The total cost of mining and milling at the following mines for the period ending with the date given is as follows:—

|                                          | s. d.  | Year ending. |
|------------------------------------------|--------|--------------|
| Montana G. M. Co. Mont., U.S.A .....     | 23 6¾  | 30/6/99      |
| do do do .....                           | 36 10½ | 31/12/01     |
| Mill at Ben d'Or, British Columbia ..... | 21 4   | /99          |
| Morro Velho Mines, Brazil.....           | 25 8   | 31/8/01      |
| New Elkhorn Mining Co., Montana.....     | 66 10  | 31/12/99     |

The milling costs—or total cost of extraction—of the last named company at the date given was 39s. 7d. per short ton.

There is thus a wide difference between the 9¾d. per ton of the Alaska-Treadwell Company and the 39s. 7d. per ton of the New Elkhorn Gold Mining Company.

In the Western Australia the Lake View Consols crushed and cyanided for 10s. 1¼d. per ton in 1898, and for 6s. 10½d. per ton in 1899, but the extraction was unsatisfactory when sulphides came to be dealt with. For these, other methods were adopted, and on August 31st, 1900, the cost of extraction was 43s. 5d. per ton. This amount was reduced to 32s. 10d. per ton during the last three months of 1900, and was still further reduced in 1901 to 28s. 3d. by the adoption of the Diehl process.

At the Great Boulder Perseverance Mine, the costs of extraction were 34s. 11½d. in 1900, and 24s. 10½d. per ton in 1901.

At the Ivanhoe Mine, Kalgoorlie, during November, 1902, the reduction costs were set down at 10s. 4d. per ton; mining, 14s. 3d.; general, 3s. 5d.; development and capital, 6s. 2d. per ton; total 34s. 2d. per ton. The question here is: What part of the general expenses is connected with the process of extraction?

At the Kagurli Mine, for the same period, the total and mining crushing costs were 38s. 5d. per ton, presumably a short ton in all W. A. instances.

At Mount Morgan, Queensland, the cost of dry crushing for 1900 is given at slightly under 4s. per ton.

At the New Ravenswood, Ltd., Ravenswood, the total cost of mining and milling their refractory ore is (1902) 38s. 10d. per ton (2,240 lbs). The works here, however, are not yet complete.

The Brothers' Mill, Ravenswood, cart and crush hard mineralized quartz for 15s. per ton, and dyke stuff for 8s. 3d. per ton. Carting in the former case costs 1s. 6d., and in the latter, 9d. per ton; concentration, by Wilfley tables, is included, but not cyanide.







Before entering into the details of our process it is advisable to briefly indicate the methods at present employed for recovering the major values from such ores. They are all comprised under the head of concentration, the usual various types of apparatus, both wet and magnetic, being employed. Concentration, indeed, has here been carried to a state of high perfection, but however ingeniously applied, it cannot, owing to intercrystallisation and the slight differences in gravity between several of the minerals, obtain sharply demarcated products; hence it can never be more than partially successful. Even supposing the bulk of the galena to be capable of close separation, a large proportion of the silver would still follow the blende, and thus be lost in the subsequent treatment of this mineral for the commercial production of spelter.

Present systems consist therefore in the mechanical separation of the largest yield of galena which shall carry only such blends as is incapable of giving rise to serious smelting trouble. These lead (silver) concentrates are smelted in the usual manner, and constitute the only product of commercial value derivable from the ore. The other by-products are zinc middlings, silicious tails, and slimes; each is more or less contaminated with all the various minerals of the original ore. Thus, whilst the galena concentrate carries several per cent. of zinc, the zinc middlings similarly hold large amounts of lead and silver, but are nevertheless of little or no present value; samples which have come before us have averaged 25 to 27 p.c. of zinc, about 12 p.c. of lead, and 10 to 12 oz. of silver. The slimes are more or less representative of the whole ore-bulk, and may even be somewhat enriched in zinc and silver; large parcels dealt with by us have been as high as zinc 25 p.c., lead 24 p.c., silver 26 oz.; but the general run is lower, say, zinc 20 to 22 p.c., lead 17 to 19 p.c., and silver 15 to 18 oz. per ton. Slimes are also at present practically valueless. Chairmen of the various mines are apt to describe these middlings and slimes as a reproach to the metallurgist, and to picture to their shareholders visions of the potential wealth which these huge accumulations represent, realisable when once the process for their successful reduction shall be discovered.

At the various Broken Hill mines reduction work is now limited to concentration, the leady concentrates being shipped to coastal smelting works, where they are reduced to bullion with other purchased ores. Net recoveries do not probably exceed 60 to 75 p.c. of the lead, and 55 to 65 p.c. of the silver; with the exception of small parcels shipped to Europe periodically no zinc is recovered, though on this point it is difficult to obtain figures.

The economics of the problem have not greatly altered from those outlined by Mr. Ashcroft in 1898, when he showed that, with the then metal prices, a profit of 15s. was all that was realisable from an ore value of some £9 per ton. Since that date it is true that considerable fluctuations in prices have occurred; zinc rose to £28, but though this was a useless boon to Broken Hill, lead appreciated to £16, and for a while permitted of good dividends. This period was shortly succeeded by a still more serious fall, lead receding to a lower level in 1901 than had been known for many years, whilst silver has recently touched its lowest recorded price. Indeed in 1901 all the Broken Hill mines with the exception of the Proprietary and Central Companies were for a while shut down. Although both lead and zinc have exhibited a slow rise of late months, the general outlook cannot be considered much brighter than Mr. Ashcroft had to face in 1898. Nor do the ore supplies show any tendency to increase in value. An average of 17 p.c. lead, 24 p.c. zinc, and 13 oz. of silver per ton may now be regarded as a general type of available material.

The greatest advances of late have been in the direction of magnetic separation; various types of magnetic concentrators are now

under trial and in use at the different mines, by which a closer saving is possible, and the further concentration of the middlings into what may be regarded as a very inferior type of zinc blende ore can be effected. The inferiority of these zinc concentrates lies in the continued presence of considerable percentages of lead, and frequently of as much as one-third the silver originally held by the ore.

By one type of magnetic concentrator known to us the galena and quartz are obtained together, a more or less impure blende as the second product, and the bulk of the rhodonite in a third; the lead product then undergoes wet dressing to separate the silica. Starting with 100 tons of ore, about 40 tons of blende product are obtainable, assaying 40 to 45 p.c. of zinc (about 70 to 75 p.c. of the total in the ore), about 7 p.c. of lead, and from 10 to 12 oz. of silver. This product is bought in limited quantities by continental smelters, but we are unable to say whether they pay for the silver or exact a fine for the lead. In this country nothing would be paid for the silver, and it is doubtful if the English zinc smelter would treat an ore containing 7 p.c. of lead, except by mixing with blende ores in order to reduce the lead to a possible smelting charge. Sixteen to twenty tons of galena concentrates are produced after water dressing, the first product containing about 75 p.c. of the original lead and 45 to 50 p.c. of the silver. The lead product is of course subject to the usual smelting losses, which may vary from 7 to 10 p.c.

A second system, investigated rather with the idea of obtaining the richest mixed galena-blende product for our own use than with the object of effecting the sharpest possible separation of each mineral, was able to produce from zinc middlings (assaying 30 p.c. zinc, 8½ p.c. lead and 12 oz. silver) a mixed concentrate amounting to 65 p.c. of the original ore weight, and carrying 39 p.c. of zinc, 11½ p.c. of lead, and 14½ oz. of silver; equal to total recoveries of 85½, 87 and 81 p.c. respectively. This was obtained by the mixing of a more with a less leady concentrate.

The foregoing is a brief sketch of the recoveries now obtainable in Australia, and is given to indicate the possible scope of inventions for remedying the unsatisfactory results realised even by the best systems of concentration.

In the cases of the many huge deposits of complex ore known to exist in other localities, but hitherto unworked, present Australian methods would not necessarily be followed as preliminary steps in our own or perhaps other processes. The Broken Hill products and accumulations are the outcome of evolutionary concentration methods, but in many instances complex ores are capable of direct reduction without the need of mechanical separation, or at most but that of barren silicious gangue if desirable.

In our search for a suitable reduction scheme we desired to confine our attention to dry processes, in order to avoid the apparently insuperable difficulties attendant upon all wet methods. When it is remembered that the weekly production of ore from Broken Hill mines amounts to some 20,000 tons, and that the maximum density of zinc sulphate liquors practically allowable cannot reach much over 20 p.c. the task of dealing with the huge necessary bulks of solution, and of leaching, filtration, concentration and precipitation, operations on such becomes appalling. Even then (electrolysis being as yet unsuccessful with aqueous zinc solutions) the result is only a product requiring dry distillation. Indeed, it becomes evident that the difficulties of wet recovery processes only really commence when the solution of zinc or other metal has been effected.

Dry processes are of course no novelty, as witness the efforts of the Smelting Corporation, of Ellershausen, Armstrong, Angel, Claus, and many others in this direction. But we believe we are correct in saying that hitherto all dry processes have started with the intention of



recovering the lead and silver in the first instance, whilst obtaining the zinc as a volatilization, or as a slag, or other residual product, for subsequent re-treatment. We cannot, however, include in this category the recently introduced Phoenix process, which, if alone from the daring ingenuity displayed, is worthy of a class to itself.

In fact zinc has always been considered as the objectionable element in the ore, and the efforts of inventors have almost invariably been towards its early elimination, with the hope, never yet realised, of a subsequent economic recovery. The reasons for this attitude are easy to discern; these ores have always been considered primarily as lead ores, whilst those interested in the zinc industry, who may have directed attention towards such, have condemned them at once as unsuitable for treatment in zinc retort furnaces, owing to the fatal presence of lead in any product obtainable by dressing.

In justice to other metallurgists we wish to mention that during the latter period covered by our investigations other workers were independently carrying out researches in the same direction, and had practically reached the same conclusions as ourselves. In this connection we would mention the names of Messrs. Sims and Christopher James as having arrived at the same results upon almost identical lines, although until we were working at the Emu works we were mutually unaware of the facts. It is therefore due to these gentlemen that they should receive full credit for their independent discovery, and we are happy to say that we have secured their co-operation in the future working of the process.

The difficulties in distilling leady zinc ores are shortly these. Foremost comes the destruction of the retorts by the reduced lead; this occurring mainly during the stirring out of the seconds from the pots, whereby the metallic lead is oxidised to litharge, with the inevitable result of the rapid slagging up and holing of the retorts. Even could this be overcome, it is found in ordinary practice that lead tends to volatilise with the metallic zinc vapours in such quantities as to materially damage the spelter produced. Finally, if lead were capable of complete elimination from the ore, we should still have the question of the silver to deal with, which, as we have shown, largely follows the blende, and would, in the usual routine, be lost both in the seconds and (similar to the lead) by partial volatilisation in the zinc vapours.

We may point out that gold also escapes under such conditions, and it was in regard to the recovery of this metal from zinc precipitates obtained from the cyanide process that we were led to devise a method for obviating such losses.\* Indeed, the success of this method induced us to further apply the same principle to the treatment of complex sulphide ores. Our idea was therefore to treat these primarily as zinc rather than lead ores; and to obviate the difficulties encountered when the material is so considered.

It is necessary to draw particular attention to the rule invariably adhered to in zinc smelting, viz.: to employ nothing except anthracite as mixing coal; it being supposed that the gases resulting from the carbonisation of other classes of fuel cause losses in spelter. Moreover, other fuels are (reasonably) considered likely to lead to the slagging of retorts during distillation,† a danger to be avoided as far as possible; even good (roasted) blende ores always contain much slag material ( $\text{Fe}_2\text{O}_3$ ,  $\text{FeS}$ ,  $\text{SiO}_2$ , etc.), whose baneful influence it is sought to reduce to a minimum by the addition of a very large excess of coal over and above that required for reduction purposes; such excess acting as a mechanical diluent. As the amount of mixing coal used in general practice varies from 50 to 100 p.c. (on the roasted ore), it is essential that this should contain the least possible ash. Further, slag-

ging troubles would be far more pronounced if an ordinary zinc distillation of roasted Broken Hill ore were attempted; as, apart from the lead and ferrous sulphides, we have also the manganous oxide (which yields a very fluid slag with silica) and much garnet. As the result, however, of our experience in the distillation of zinc-gold material, we formed the opinion that the use of a strongly-coking coal would, by holding dangerous materials suspended in its pores, overcome the objections to the presence of lead and other slag formers, and permit of the distillation of complex blende-galena ores as ordinary spelter-yielding material. In this factor alone has lain our main departure from previous methods, and extended practical trials have proved our anticipations correct. It is unnecessary here to further trace our progressive trials, and we may now consider the completed process.

It commences with the usual preliminary roast of the crushed ore, slimes, or zinc-lead concentrate, in a reverberatory furnace, to a product which shall contain, preferably, not more than 3 p.c. of total residual sulphur.

Although this is the usual sulphur limit for blendes, we have frequently obtained good zinc recoveries with a higher sulphur residue; calcination is only necessary to such an extent that any residual sulphur should be capable of combining with the iron present in the product. In the case of Broken Hill ores, this usually amounts to about 10 p.c.

The roasted ore is next mixed with only about 20 p.c. of crushed coking coal, and the mixture is briquetted in any suitable type of machine. As a binding agent pitch, or other carbonaceous material, is added; lime or other chemical binders are undesirable as they tend to permeate the whole briquette with slagging material, and also, from some unexplained reason, to cause lead losses. Other carbonaceous binding materials have been the subject of later experiment, one of which it is probable will shortly supersede our use of pitch for this purpose. Further, the admixture of a carbonaceous bond aids the bituminous coal in forming the coherent coke which not only the distillation but the subsequent lead-smelting operations demand. The briquetting plant is of a standard type consisting of a disintegrator, into which the roasted ore, coking coal, and pitch, are introduced, a pug-mill, press and table, together with the usual intermediate elevators and a conveyor belt for delivering the finished briquettes to the retort house.

The briquettes are then submitted to distillation in an ordinary zinc retort-furnace. Those used by us at the Emu works in South Wales are of the old-fashioned hand-fired Welsh-Belgian pattern, without regenerators, and using hand-made pots. Each contains 144 retorts in six rows, the lowest being cannon pots; a retort takes about 15 briquettes, the total capacity of a furnace being seven tons.

This type of furnace is, nevertheless, not the most suitable for our requirements, as six rows of retorts one above the other cannot be uniformly heated by bottom firing. The lower row of cannons is apt to be damaged by excessive heat if the uppermost rows are to receive an adequate temperature; too sharp a heat is also detrimental to the best extraction. In most spelter works employing this type of furnace the difficulty is avoided by using the lower rows for the distillation of "hard" material (roasted blende), whilst the upper are employed for "soft" (calamine) ores. A third class, of even softer material, viz., calamine ores mixed with sweeps, may at times be used in the upper rows. On uniform material such as we treat a compromise must be effected; we therefore work to obtain the best results from the three intermediate rows. These give us a 70 p.c. zinc recovery on 26 p.c. briquetted ore, whilst the lower and upper rows yield a few per cent. less.

For these reasons the gas-fired 2-row type of furnace has been

\*See Journ. Soc. Chem., Ind. xvi, p. 967, also Trans. Inst. Min. Eng., March 20th, 1898.

†Louis and Schanel, II, 89.



adopted for our process at Cockle Creek, as it permits of absolute uniformity of heating, and, therefore, of the maximum recovery. Hydraulic-pressed retorts, so universally used on the Continent and in America, are also employed in Australia. In ordinary zinc-smelting practice the roasted ore and anthracite duff are hand-mixed in front of each furnace, the damped powder being then charged into the retort; by our method the mixing is more efficiently performed in the briquetting plant, and the charging of the briquettes is more easily effected by means of a shaped iron paddle. In usual practice 4 to 4½ minutes is consumed in charging powdered material into the retorts by means of a scoop, as against 2 minutes with briquettes: this means a saving of some 4 hours' labour per furnace.

Once charged, the procedure for the recovery of the zinc is identical with ordinary practice, although the action within the retort is of a different character. The briquettes, as they reach the temperature of distillation of coal, coke into coherent masses, with evolution of volatile hydro-carbons. Reduction of the lead simultaneously occurs, the minute metallic particles entirely permeating and being held up in the pores of the coke; whilst, at the higher temperature shortly afterwards reached, zinc oxide is reduced, and yields metallic zinc vapours, which are condensed in pipes; these are tapped at intervals in the ordinary way. The distillation occupies the normal time.

We draw attention to the remarkable fact, first noticed at the outset of our experiments, now confirmed by some years, experience, that, whereas in ordinary practice lead distils to a marked extent in zinc vapour, in our process the whole of the lead, as also the silver and gold, is retained by the coke. The latter thus appears to exert an actual physical retardation of the volatility of lead in a slow current of zinc vapour. So definite is this advantage, that we find the smelter thus produced from Broken Hill ores to be of exceptional purity, averaging 99 p.c. of metallic zinc, and commanding prices equal to that of the best brands produced from lead-free ores. This spelter is already in considerable demand, owing to its low lead tenour, which does not often exceed ½ p.c.; it can thus be employed for the manufacture of the finer kinds of brass, for which the ordinary brands, containing from 1 to 2½ p.c. of lead, are useless.

The zinc having been recovered, the seconds are withdrawn from the pots (pipes and luting clay having been removed, and sweeps collected) and discharged into the caves, whence in usual practice they would be dumped. But the seconds resulting from the treatment of such complex sulphide ores still retain the major values, in the shape of all the lead and silver originally present. These are obtained in the coked briquettes in a form eminently adapted for recovery in the subsequent lead smelt. The zinc retained in the seconds does not exceed the amount allowable in ordinary practice, and presents no difficulty in obtaining the usual bullion recoveries. The residual carbon in the seconds is, of course, a considerable source of heat in the after-smelt, and is therefore not lost, as it is in the case of ordinary zinc seconds.

By this simple operation we are enabled to convert a complex ore into a simple silver-lead product, amenable to normal reduction methods, having already recovered the bulk of the hitherto objectionable zinc as high-quality spelter. The final operation for the recovery of lead and silver as base bullion being the ordinary one, conducted in the usual types of plant, both in South Wales and Australia, does not call for further description here.

Indeed, we may remark that the few operations which constitute our process are all affected in well-known and standard types of plant; and that no fresh item of apparatus, concerning which there might be doubt as to costs or method of working, has been found necessary. Roasting, briquetting, zinc-distilling and lead-smelting methods and costs are fully known. Throughout the operations, nothing beyond

coal and binding agent and the usual lead-smelting fluxes is employed. It is somewhat surprising that so simple a method of treatment has been so long overlooked. The system is compact, and permits of economies, when zinc and lead-smelting processes are thus linked together, not realisable by either separately.

In general, blende ores containing less than 40 p.c. of zinc are not profitable to treat. Such if mixed with 80 p.c. of anthracite duff would yield pot material containing little more than 22 p.c. of zinc; whereas a zinc-lead concentrate, containing say 35 p.c. of zinc, requires, by our process, the addition of only 25 p.c. of mixing coal and binding material, and produces a briquette carrying 23 p.c. of zinc; with the additional advantage of yielding a residue containing profitable material. It is possible to treat a 35 p.c. concentrate for its zinc alone, the lead and silver remaining in the residues as profits subject only to recovery costs; whilst the fuel values remaining aid in reducing these.

*Recoveries.*—Lead, silver, and gold, as before stated, are recovered in the seconds in full; the lead of course is subject to the normal smelting losses, just as in the treatment of ordinary lead concentrates; though the Huntingdon and Heberlein and the Carmichael processes claim to reduce such losses to about 2 p.c. and we believe these claims to be well founded.

Bearing in mind the fact that the seconds hold all the lead in the metallic condition the question naturally arose as to whether smelting was the most economical method of recovering this metal and the silver. We devoted considerable attention to the mechanical separation of the reduced lead, but unsuccessfully. The metallic particles and prills are so exceedingly finely divided throughout the carbonaceous sponge that any method of water dressing or concentration results in heavy loss; nor did oil concentration give any better results, owing to the excessive amount of carbon also taken up. On the whole, smelting was adopted as the simplest, safest, and most usual method.

With regard to zinc recovery, the spelter yields are practically the same as those obtained in the ordinary treatment of blende ores. To reckon in percentages is somewhat illusory, as these depend naturally upon the original zinc contents of the ores treated. With a zinc-lead product carrying 40 p.c. of zinc no difficulty is experienced in obtaining a recovery of 80 p.c. of that amount, whilst, with a 25 p.c. material, 70 p.c. may safely be reckoned upon in modern furnaces. Late advices from Cockle Creek inform us that the recoveries of both lead and silver in the seconds are complete, and that the zinc production already exceeds 70 p.c. slimes averaging 25 p.c. of zinc being the raw material used. These results have naturally been progressive, and represent our later practice. Some six months ago our average recovery from Broken Hill slimes was about 60 p.c. of zinc, but by more careful location of the varying retort row yields the increased zinc recoveries have been attained to. With 35 p.c. material we have every reason to anticipate an 80 p.c. recovery. The pot consumption is quite normal there; mixing coal is obtainable at lower rates than are available to us in South Wales. Fireclay of good quality for the manufacture of hydraulic-pressed retorts is also available on the spot; and we have used trial lots of this material for some of our retorts in South Wales, with excellent results. The works at Cockle Creek are the first producers of spelter yet installed in Australia.

In ordinary zinc practice, it is not found economical to force the extraction below a certain point, as the increased time required not only reduces the output of the furnace, but, with the higher temperature necessary, the pot consumption becomes unduly great. The zinc usually left in the seconds varies from about 5 p.c. to 8 p.c. Our working costs are also normal; no difficulty is experienced in calcining the complex ores to the sulphur standard usually required for blende; the zinc furnaces do not demand any greater attention or further



hands, whilst labour in retort charging and discharging is materially lightened by the use of briquetted material. Briquetting charges are, of course, additional; but are to some extent balanced by the far smaller consumption of mixing coal, and by the economical handling of material during the final lead smelt.

A point to which attention will doubtless be directed is that of pot and pipe consumption. The average life of our pots, even though used for distilling such highly refractory material, is fully equal to that of the retorts used for good blende and calamine ores according to usual methods, being from five to six weeks each. Our present consumption per day is 3.7 pots per furnace. The cost of our hand-made pots is about 6s. apiece. This is admittedly high, even for England, and hydraulic-pressed retorts, having a longer life, requiring less clay and demanding a lower distillation temperature can be produced for 3s. each.

A certain proportion of "fines" is inevitably produced in raking the briquette seconds from the pots into the caves beneath the furnace house. These are separated, damped with water, and re-briquetted for lead-smelting purposes from time to time at a cost of about 2s. per ton of fines.

We append a schedule of costs incurred during the late treatment of a parcel of Broken Hill slimes, averaging 25 p.c. of zinc, 24 p.c. of lead and 26 oz. of silver per ton.

Calcining.—Hand roasting of such material to 3 p.c. of total sulphur or slightly under, in South Wales, costs about 9s. per ton, whilst mechanical roasting in the Godfrey furnace amounts to about 6s. 6d. Other forms of mechanical calciners, such as the Brown Straight Line, will roast complex sulphide ores to this limit at even lower cost: but at present the hand-calciner and the Godfrey appear to yield the denser product and also to be preferable in other respects. The question of the best form of calciner is not fully settled, but we select the Godfrey costs as those most lately obtained.

#### COSTS PER TON OF ORE TREATED.

|                                                                       | s. d.  | s. d.  | s. d. |
|-----------------------------------------------------------------------|--------|--------|-------|
| <i>Ore Drying</i> —Screening and crushing of lumps, and wheeling..... |        |        | 2 6   |
| <i>Calcining</i> —Fuel, labour, maintenance.....                      |        |        | 7 0   |
| <i>Briquetting</i> —(30 tons of roasted ore per day)—                 |        |        |       |
| Labour—1 pressman at.....                                             | 5 0    |        |       |
| 3 belt men at.....                                                    | 5 0    |        |       |
| 2 labourers at.....                                                   | 3 9    |        |       |
| Boilerman.....                                                        | 4 9    |        |       |
|                                                                       |        | 32 3   |       |
| <i>Coal</i> —                                                         |        |        |       |
| 1 ton for boiler.....                                                 | 8 6    |        |       |
| 6 tons for mixing, at 8s. 6.....                                      | 51 0   |        |       |
| Pitch—1½ tons at 48s. 4d.....                                         | 72 6   |        |       |
| Stores—Oil, etc.....                                                  | 1 3    |        |       |
|                                                                       |        | 165 6  |       |
| Cost of briquetting 30 tons=                                          |        |        | 5 6¼  |
| =per ton ore.....                                                     |        |        |       |
| <i>Retorting</i> —(Costs per furnace per 24 hours)—                   |        |        |       |
| Labour—2 foremen at 6s. 8d.....                                       | 13 4   |        |       |
| 2 second hands at 5s. 6d. . . . .                                     | 11 0   |        |       |
| 2 helpers at 4s. 3d.....                                              | 8 6    |        |       |
| 4 cave men at 4s. 3d. . . . .                                         | 17 0   |        |       |
| 1 pipe chipper (boy) . . . . .                                        | 1 4    |        |       |
| General labour.....                                                   | 5 9    |        |       |
|                                                                       |        | 55 11  |       |
| <i>Pottery</i> —3. 7 pots at 6s.....                                  | 22 3   |        |       |
| 9 pipes at 2d.....                                                    | 1 6    |        |       |
| Coal, for firing ¾ tons at 9s. 6d.....                                | 30 10½ |        |       |
| Stores, luting clay and repairs.....                                  | 4 6    |        |       |
|                                                                       |        | 116 0½ |       |
| Contingencies, unoccupied pots, dead-fires, etc., add 5%.....         | 5 9½   |        |       |
|                                                                       |        | 121 10 |       |

|                                                                                                      |           |
|------------------------------------------------------------------------------------------------------|-----------|
| For charge of 7 tons briquettes = 5.6 tons of ore = per ton.....                                     | 21 9      |
| Yard and general labour.....                                                                         | 1 6       |
| Re-briquetting of "fines," at 2s. per ton,—                                                          |           |
| Seconds contains 30% fines; on 80% of seconds.....                                                   | 5¾        |
| (Seconds amount to about 80% on the original ore.)                                                   |           |
| Smelting per ton seconds.....                                                                        | 12 6      |
| Refining, sales, brokerage, insurance, etc., at £2. per ton of bullion produced, at 26% bullion..... | 10 5      |
| Per ton of seconds.....                                                                              | 22 11     |
| =per ton ore.....                                                                                    | 18 4      |
| Lead smelting losses—                                                                                |           |
| 2.8 units of lead (=10% on residues) at 2s. 3d.....                                                  | 6 4       |
| 5% silver=1¼ oz. at 2s. 1d.....                                                                      | 2 8       |
| Office management and assays dependent on size of installation, say.....                             | 5 0       |
| Total cost of treating 1 ton of ore.....                                                             | 71 1      |
| Recoveries—                                                                                          |           |
| Zinc, 70% (of 25%)=17.5 units at 3.65s.....                                                          | 63 10½    |
| Lead, 90% (of 24 p.c.)=21.6 units at 2s. 3d.....                                                     | 48 7¼     |
| Silver, 95 p.c. (of 26 oz.) 24.7 oz. at 2s. 1d. ....                                                 | 51 5½     |
|                                                                                                      | 163 11¼   |
| Less costs.....                                                                                      | 71 1      |
| Realisations.....                                                                                    | £4 12 10¼ |

From which must be deducted cost of transport of slimes or cost per ton of ore.

In regard to the first four items the above costs are certainly capable of reduction.

In South Wales we have at present no lead-smelting plant for spot recovery of the seconds values, but dispose of these to local reduction works according to their assay values upon the usual scale of returning charges. The erection of lead-smelting plant at our own works is under consideration, in order to save these extraneous profits and to obviate freight to the smelters. In Australia, the smelting plant is that in ordinary use for reduction of the lead concentrates, etc.

The work outlined has occupied our attention for some years past, during which we have carried through a large number of experiments in the laboratory, in small works specially erected in Surrey, and finally at the Emu works in South Wales, where large-scale furnaces have been running for the past year as a commercial undertaking. We have there treated over four thousand tons of Broken Hill slimes, besides many other parcels of complex sulphide ores. The recoveries of lead and silver have been practically complete in all cases, whilst the spelter yields have varied from 60 p.c. to 80 p.c., according to the original zinc contents.

Complex ores containing copper present no further difficulties as to retort treatment; the copper, of course, remains with the lead and silver in the seconds, and is thence obtainable by modern copper-lead smelting methods.

Summarising our process, it may be said to consist in the holding up of the minute particles and prills of reduced silver-lead in a coherent but still highly porous coke or carbonaceous sponge during zinc distillation; thus preserving the retorts from contact with lead or other slag material, and ensuring the all but complete non-volatility of the lead and silver in the liberated vapours of metallic zinc.

We do not claim to have invented a new metallurgy of either metal-zinc or lead: practically all spelter now produced is retort spelter, and except as to certain advantages, our process is subject to the same economic conditions as is the ordinary zinc smelter. Nor do we claim to be freer from lead-smelting methods and costs than the lead



smelter: whilst zinc, lead, and silver recovery methods remain what they are, we are content to have reduced these hitherto refractory mixed ores to ordinary simple zinc and lead reduction operations. Local metallurgists can therefore insert the figures and costs obtaining in their own districts for those we have given here; until new processes for the reduction of either metal are discovered, and the electrolysis of zinc, even from the fused chloride, has yet to prove its commercial utility, we may fairly consider that complex sulphide ores are at length amenable to ordinary methods.

In spite of its apparent simplicity, our process has been found capable of complete patent protection in the principal countries and colonies of the world; whilst the grant of the United States, German and Scandinavian patents, may be taken as evidence of novelty.

### Dredging and Valuing Dredging-ground in Oroville, California.\*

By NEWTON BOOTH KNOX.

The gravelly bottom land below Oroville, California, is being extensively mined for gold by means of dredgers. Upon a strip of land nine miles long by two miles in width, bordering on and adjacent to the Feather River, 21 dredges are at present working. These dredgers are the property of about twelve companies, who own dredging land varying from 80 to 800 acres. The companies are all close corporations, and though the official figures of working costs and profits are difficult to obtain, it is well known that they yield their stockholders excellent dividends. For instance, one company's working expenses, including labour, repairs, power, interest on capital invested, depreciation of plant, sinking fund, etc., amounted to but 32 p.c. of the bullion output, leaving the remaining 68 p.c. clear profit.

The total general average of the drillings of several of the largest companies' holdings, covering a period of several years, gives the value of the gravel between 17 and 19 c. per cubic yd., and an average depth of 11 yd. As a dredge handles from 1,200 to 2,000 cub. yd. per day, at a cost of from 5 to 8 c., average 6 c., per cub. yd., it is evident that the returns in this work are considerable.

**HISTORY.**—In the early days of California history, Oroville district was extensively mined by first the white man and later by the Chinese. It is claimed that 82 millions of dollars has been taken out within a radius of eight miles of the town of Oroville. The gravels were worked to water level, and washed mostly in hand rockers. Pits and small shafts were sunk until a rich pay streak was encountered, which was followed, drifted out, hoisted to the surface and rocked. Water interfered greatly with this style of mining, and only the richest streaks could be worked. The gravels left, made excellent dredging ground.

**THE GRAVELS.**—The gravel deposit about Oroville evidently represents the flood plain of an ancient stream of the Sierra Nevada, near the point where it débouched into the gulf which then occupied the present Great Valley of California. As stated, the gravels average about 33 ft., varying from 28 ft. to 60 ft. in depth. A false bed-rock of lava-ash, or volcanic tufa, varying from the consistency of chalk to that of firm sandstone, is encountered at this depth. Below this false bed-rock are gravels and sand. In one place a hole was drilled 80 ft. below, and showed sharp white sand. In some places the gravel is topped by a red soil overburden, varying from 10 ft. to 25 ft. in thickness. This overburden, and the material below the false bed-rock, contain little or no gold. The gravel is fairly coarse, large boulders, weighing 300 lb. or 400 lb., being very exceptional. One-half of the gravel will pass through a ½-in. screen. As a rule the gravel is not cemented, though some dredgers have encountered pieces of ground which had to be loosened with powder.

The gold is distributed more or less equally throughout the gravels. Rich concentrated streaks of from an inch to a foot in thickness occur, followed by barren sandy areas, which seem to represent varying conditions of flow in the depositing stream. The gold is in a very finely divided state, and easily caught by the riffles, cocoa-matting and quicksilver of the dredge. Nuggets are a rare occurrence. The gold found in the bore-holes is 922 fine, and worth \$19 an oz. The dredge bullion is somewhat lower grade, the base

being the surprisingly large amounts of lead in the form of quail, rabbit and duck shot, which the dredge digs up.

This fact is interesting and would be hard to believe if it were not very well authenticated. This region has been a great small-game country, and during the last fifty years doubtless thousands of pounds of shot have been scattered over the gravels which the dredge is now recovering. Nor does it require such reckless shooting on the part of these old hunters to reduce the bullion grade as would at first appear. Take an 11-yd. bank of gravel; this contains 50,000 cu. yd. to the acre—a dredger could treat an acre of this a month, producing a bar per month of say \$10,000, or, roughly, 500 oz. of bullion.

Now if the bullion from drillings went \$19 = 950 fine all gold  
and " " dredger " \$17 = 850 "

or 50 oz. gained in lead in the 500 oz. bar, fifty ordinary shot gun shells, 12 gauge, would furnish this much shot. The baseness of the bullion however does not truthfully represent the amount of shot, as on most of the dredgers the lead is separated by panning, and carefully picked before the bullion is melted. On the Butte Dredger they have collected about 50 lb. of shot from about two acres of gravel.

Occasionally a pistol ball is found, recalling the golden glorious, old days of California history, when some festive "man behind the gun," filled with enthusiasm and "barb-wire" whisky, would sally forth in search of trouble, and—generally find it.

The Oroville district is peculiarly favourable for dredging, for the following reasons:—

- (1) Bed-rock (so-called) is soft and easily cut by the dredge.
- (2) Boulders are small.
- (3) Water is available.
- (4) Power (electric) is cheap.
- (5) Gold is fairly evenly distributed.
- (6) Climate is such that work can be carried on twelve months of the year.
- (7) Labour is cheap and efficient; and finally
- (8) The gravels contain enough gold.

**TESTING THE GROUND.**—In order to ascertain whether a piece of ground is worthy of consideration, the following system is adopted:

The land is first divided, according to its area, into blocks of from 5 to 10 acres, and a hole is drilled in the centre of each of these blocks.

The Keystone driller has been generally adopted in Oroville as having proven itself fully equal to this work. The driller consists of a "walking beam" operated by steam power producing the required motion for raising and dropping the drill. In addition to this is a reel, on which is wound the rope of the sand-pump used in pumping out the holes. The drill is suspended by a 2-in. in diam. Manila rope, which passes under one sheave on the walking beam over another to the main drum. As the walking beam moves, the rope is alternately tightened and loosened, which raises and drops the drill. The drill itself consists of:—

1. Rope socket.
2. Drill stem—a piece of soft steel about 4 in. diam., and from 12 to 15 ft. long.
3. The bit, with a single cutting face about 5½ in. long.

When ground containing coarse boulders is being drilled, there is a liability of the drill becoming wedged in the hole, and in order to prevent this, a tool called the jars is inserted between the rope socket and the stem. It is like two links of a chain, and when the bit is caught these two links coming together with a shock jar the drill loose.

The whole string of tools, socket, jars, stem and bit weigh about 1200 lb.

**SPEED.**—The driller makes about sixty 30 to 40-in. strokes per minute.

**FUEL.**—About a half cord of oak wood is burned per day of ten-hour shift.

**WATER.**—For drilling and washing the drillings about 1000 gal. of water is used per day.

**THE OPERATION.**—The land is surveyed, and the location of the drill holes staked out and marked by flags. The drill is set up over flag No. 1. A hole is shovelled out to a depth of about 2 ft., and the first length of casing is made ready. This section of casing or drive-pipe is 5½ in. inside diam., ¾ in. thick, and about 5 ft. long. It is fitted with a wrought steel drive shoe to protect the lower end from injury. This drive shoe is made 7½ in. in diam. at the cutting edge and is slightly bevelled inward. On the other end of the casing is screwed a steel driving head to prevent the threads from being battered during driving. This casing, so mounted, is set up in the hole directly under the suspended drill and tamped around with excavated dirt.

\*Paper read before the Institute of Mining and Metallurgy.



Drilling is now commenced. Water is poured in from time to time to thin out the material. After the ground below the foot of the shoe is loosened for a distance of, say, 1 ft., the casing is driven down and the loosened and thinned material removed by means of the sand pump, a hollow pipe supplied with plunger and foot valve.

The driving is accomplished by striking the driving head with a couple of iron blocks clamped to the stem by means of two 1 3/4 in. bolts, the weight of the string of tools acting as a hammer. After driving, the driving blocks are removed. When the first length of casing is driven down to head, the driving cap is removed, a second section of casing is screwed on the first, the driving cap replaced, and drilling resumed. When the required depth is reached, determined either by striking "bed-rock" or passing through the pay stratum, the hole may be considered finished, and the next step is to pull up the casing. This is accomplished by removing the bit, stem and jars, and replacing them by what is known as the pulling or pipe jars. These consist of an iron boss fixed to the end of a rod 4 1/2 ft. long. Above the boss is a 1 in. thick plate—the "knocking head"—provided with threads which are screwed into the sleeve of the top section of casing. The stem of boss passes through a square hole in the plate. The walking beam is set into motion, and the string of casings is raised by the boss striking against the knocking head. As each section of casing is raised, it is unscrewed, and the knocking plate screwed on the next. If care is used in keeping the threads of the casing clean, the casings can be used for a long time. It is rarely that a casing is lost.

TREATMENT OF DRILLINGS.—The drillings extracted from the drill-hole by means of the sand pump are discharged into a wooden trough, 12 ft. by 1 ft. by 1 ft., set on a slight grade. From the trough they are run into the riddle of a rocker, and rocked in the ordinary method adopted for washing gravel. Great care is taken to save all the extremely fine particles of gold, as upon this work depends the accuracy of the test made. It is customary to clean up results of each pumping, and to carefully note the number of countable colours obtained, and the character of the ground drilled through.

For instance, a page of the driller's note book taken from actual practice is as follows :—

HOLE No. 14.

| PUMPING.              | COLOURS.                   | REMARKS.                                 |
|-----------------------|----------------------------|------------------------------------------|
| Surface—10 ft.        | 1 speck                    | { Red soil, clay, sand, and fine gravel. |
| 10 ft.—11 ft.         | 22 fine colours            | Gravel starts at 10 ft.                  |
| 11 ft.—12 1/2 ft.     | 52 colours and fine gold   | Fine gravel.                             |
| 12 1/2 ft.—13 3/4 ft. | 14 colours and fine gold   | Coarse gravel.                           |
| 13 3/4 ft.—15 1/2 ft. | 4 fine colours             | Gravel softer.                           |
| 15 1/2 ft.—16 1/2 ft. | 4 fine colours             | Gravel softer.                           |
| 16 1/2 ft.—17 1/2 ft. | 8 fine colours (1 fat one) | Gravel coarse.                           |
| 17 1/2 ft.—18 ft.     | 7 colours and fine gold    | Gravel coarse.                           |
| 18 ft.—19 1/2 ft.     | 6 fine colours             | Gravel coarse.                           |
| 19 1/2 ft.—20 1/2 ft. | 8 colours, some large      | Gravel coarse.                           |
| 20 1/2 ft.—23 ft.     | 16 colours, some large     | Gravel coarse.                           |
| 23 ft.—23 1/2 ft.     | 16 fine colours            | Finer gravel.                            |
| 23 1/2 ft.—24 1/2 ft. | 21 colours and fine gold   | Finer gravel.                            |
| 24 1/2 ft.—25 1/2 ft. | 8 colours, fine gold       | Finer gravel.                            |
| 25 1/2 ft.—26 1/2 ft. | 13 colours, some large     | Finer gravel.                            |
| 26 1/2 ft.—28 ft.     | 6 colours and fine gold    | Finer gravel.                            |
| 28 ft.—28 1/2 ft.     | 5 colours, fine gold       | Fine gravel.                             |
| 28 1/2 ft.—29 1/2 ft. | 8 very fine colours        | Stopped in fine gravel.                  |

WATER LEVEL 21 FT.

The term "fine gold" is applied to such specks as are too small to be counted, but which play an important part in making up the total value of the hole. The gold from each clean-up is put in a small dish.

This practice of cleaning up after each pumping (approximately after each foot of hole drilled) instead of one final clean up is all-important in furnishing data for a cross-section map, showing occurrence of rich streaks—sandy or clay patches, fine gravel, depth of over-burden, of false bed-rock, and of water level.

After the last clean-up all the gold from the hole is collected by means of quicksilver forming an amalgam. This amalgam is dissolved in nitric acid and thoroughly washed in hot water. A few drops of alcohol added to the wash water will prevent the spattering and loss of gold when the last drop of water is evaporated. The gold is annealed and carefully weighed. From this weighing the value of the ground at this particular spot is calculated, and the result given in cents per cubic yard.

CALCULATING THE VALUES is best shown by an example. The gold from say, hole No. 14 weighed 2.22 gr. ; this at 3.95 c. per gr. equals 8.76 c. ;

the value of gold from hole No. 14. The cubic contents of the whole is next calculated. To do this, a factor called the "pipe constant or pipe factor" is applied. The inside diam. of casing is 5 7/8 in. ; the outside diam. is 6 1/2 in. It is the practice of the district to use the outside diam. of the pipe as a basis for calculating its contents, the local engineers holding that it is the displacement of the pipe and not the cubical contents that should be used. Figuring the cubic contents per ft. of pipe, with a diam. of 6 1/2 in., would give .23 cub. ft. In practice it is found that .23 is much too small, giving values too high, values not borne out by subsequent dredging.

Some engineers use .25 as factor. "Radford's Factor" is .27—a factor obtained by Mr. W. H. Radford, a mining engineer of wide experience in this class of work, by the following method ; Mr. Radford sunk a shaft 3 in. in diam., using a drill-hole as the centre, to a depth of 34 ft. The gold obtained from the shaft corresponded almost exactly with the gold obtained from the drill-hole when using .27 as the factor in the calculation. This factor is very important, as on it depends the value of the holes and consequently the final value of the ground. The difference in the results obtained by using either the factor .25 or .27 is sufficient to change the value per cub. yd. from net to gross, i.e., a difference in some cases of 6 to 8 c. per cub. yd.

Continuing the calculation : Hole No. 14 was 29 1/2 ft. when drilling was stopped ; 29 1/2 + .27 gives 7.965 (cub. ft. in the hole drilled). Now we have the simple proportion, 7.965 (cub. ft. of gravel drilled : 27 (the number of cub. ft. in a cub. yd.) :: 8.79 (the value of gold obtained) is to X = the value per cub. yd., whence, X = 29.69 c. per cub. yd.

CALCULATING THE AVERAGE VALUE PER CUB. YD.

The value of each hole in cents per cub. yd. is multiplied by its depth in feet, and the sum of the products divided by the sum of the depth ; the quotient is the average value in cents per cub. yd. Thus we have a block of dredging ground drilled with one hole to every 10 acres.

The sum of the products obtained by multiplying each depth by its corresponding value = 14.045. The sum of the depths is 660 ft. Dividing the first by the second gives 21.28 c. per cub. yd. = average value of this ground. The average depth is 33 ft., or 11 yd.

FINAL CALCULATIONS.—At an average of 11 yd. deep this ground will contain 53,240 cub. yd. to the acre, and allowing 3240 cub. yd. for ridges and "corners" left in dredging, we have 50,000 cub. yd. per acre, or 10,000,000 cub. yd. in the 200 acre tract under consideration. This at 21.28 c. per cub. yd. gives a total contents of..... \$2,218,000

|                                    |           |
|------------------------------------|-----------|
| Assuming the price is.....         | \$150,000 |
| Cost of a 5-ft. bucket dredge..... | 65,000    |
| Working Capital.....               | 10,000    |
| Total Cost.....                    | \$225,000 |

A 5-ft. bucket dredge is rated at treating 65,000 to 70,000 cub. yd. per month, but up to the present time, the best these dredges have been able to do has been about 70 p.c. of the possible running time. It may be added that the new dredges now building hope to better this, and will doubtless bring up the running time to 80 p.c. In fact a new dredge, the "Butte," which has been running but three months, has, during that time, averaged 75 p.c. and the last month of their run they have averaged 86 p.c. of the time. Assuming 70 p.c. running time, a 5-ft. dredge will work out this ground at the rate of an acre per month, or in all, about 17 years for the tract. Assuming a working expense of the dredge as high as \$3500\* a month, or \$42,000 per year, and that 1 c. per cub. yd. is left in the tailings,† then we have—

|                                                                                                    |             |
|----------------------------------------------------------------------------------------------------|-------------|
| Total value in ground.....                                                                         | \$2,218,000 |
| Total value in tailings.....                                                                       | 100,000     |
| To be recovered.....                                                                               | \$2,028,000 |
| Total cost of treatment.....                                                                       | 714,000     |
| Net gain in ground.....                                                                            | \$1,314,000 |
| Net annual gain for 17 years.....                                                                  | 77,300      |
| Net annual gain per cent, 34.3 p.c.                                                                |             |
| Or allowing a sinking fund—17 year's life, annual contribution to sinking fund—to be at 3 p.c..... | 10,300      |
| To be applied to dividends.....                                                                    | \$67,000    |
| Gain per cent per year on investment with sinking fund.....                                        | 30 p.c.     |

\*\$2500 per month is closer to a fair average of the month's expenses even when allowing a sum of \$500 for possible repairs.

†A test has lately been made by Mr. W. H. Radford in the "Butte" tailings which were found at the end of the sluices, and which represent say 50 p.c. of the bank gravel. From 100 buckets of this material six-tenths of a cent in gold and a little quicksilver, about the size of a peppercorn, were obtained.



## COST OF DRILLINGS.—The running expenses of a driller per day is:

|                                 |         |
|---------------------------------|---------|
| Labour, 1 Driller.....          | \$3 50  |
| 1 Fireman.....                  | 2.50    |
| 1 Teamster and team.....        | 3.50    |
| Chinese rockerman.....          | 1.50    |
|                                 | <hr/>   |
| Wood, half cord, at \$6.00..... | \$11.00 |
| Repairs, say.....               | 3.00    |
| Drill hire.....                 | 5.00    |
|                                 | <hr/>   |
| Total Expenses per day.....     | \$24.00 |

Drilling about 10 ft a day gives a cost of \$2.40 a ft. Drilling contracts at Oroville are let for \$2.50 per ft., and considering delays, breakdowns, repairs, road cutting and moving from hole to hole, this figure is reasonable enough. The number of feet drilled per day varies greatly—and depends on the character of ground and the season. In soft ground 20 to 30 ft. a day can be drilled with a corresponding reduction in cost per foot. In winter and spring, when the top soil is wet and soft, the problem of moving the machine from hole to hole, and of bringing in wood and water becomes a serious one. Just to show the extra difficulties, delays and stoppages a driller must contend with, I quote in full the log of Mr. Radford for the month of December, 1902:—

1st.—Started hole No. 12, but did not do much owing to lack of good driving cap and scarcity of water. Made 14 ft.

2nd.—Drilling on hole No 12 all day. Made 7 ft.

3rd.—Started about 7.30 a.m. Broke sand pump about 8.15. Had to take it to town to get it repaired. Finished hole No. 12 at noon. Commenced pulling casing 12.30. Finished and moved to hole No. 18—1320 ft. Set up and started drilling.

4th.—Worked all day on hole No. 18. Made 20 ft.

5th.—Wet, did not work.

6th.—Started work on No. 18 after lunch. Made 7 ft.

7th.—Wet, did not work.

8th.—Worked on hole No. 18. Made 11 ft. Started pulling up casing.

9th.—Finished pulling up casing from hole No. 18, moved to hole No. 20 about 900 ft., ground very soft, had to raise drilling machine with jackscrews, and to keep it up by means of wood placed under the wheels. Made 14 ft. in hole No. 20.

10th.—Wet, did not work.

11th.—Wet, did not work.

12th.—Worked on hole No. 20.

13th.—Finished hole No. 20, 34 ft. deep; pulled up casing and started moving to hole No. 14—ground very soft.

14th.—Moved to hole No. 14, and set up machine, ground very bad in places; distance from No. 20 to No. 14, 1,320 ft.

15th.—Working on hole No. 14, made 17½ ft.

16th.—Working on hole No. 14; reached depth of 28 ft., broke bolt in driving blocks, got new one from machine shop in town. Lost two hours.

17th.—Finished hole No. 14, 29½ ft. deep. Pulled up casing and moved machine a short distance towards hole No. 16.

18th.—Moved machine about 100 yd. Got into soft mud and stayed there all day.

19th.—Raised machine out of the mud. Took off gear-ring on account of broken teeth, and took it into town and got it repaired.

20th.—Got gear-ring about noon, put it back on machine, and started, ran short distance towards hole No. 16.

21st.—Moving machine to hole No. 16, road very bad in places.

22nd.—Moving to hole No. 16, 1,320 ft. from hole No. 14. Set up machine, and started drilling. Struck old drifted ground. Made 21 ft.

23rd.—Finished hole No. 16, 29 ft. deep. Pulled up casing and moved toward hole No. 10.

24th.—Finished moving to hole No. 10, 1,320 ft. Set up machine and drilled 4 ft.

25th.—Working on hole No. 10, reached depth of 19½ ft.

26th.—Wet, did not work.

27th.—Ground too soft to haul wood and water.

28th.—Working on hole No. 10; reached depth of 31 ft.

29th.—Working on hole No. 10; reached depth of 41 ft.—stopped.

30th.—Finished pulling casing from hole No. 10 soon after lunch; started moving to hole No. 8.

31st.—Finished moving to hole No. 8, 1,320 ft. Set up machine and started drilling. Broke walking-beam arm, had to send to town for a new one—lost three hours. Made 13 ft.

Although the crew worked a ten-hour shift during this month, only 7 holes were finished, giving a total depth of 212½ ft., or an average of 6.8 ft. a day."

I quote this, not as an example of average work, but merely, as I have said, to show the difficulties—particularly in winter.

VALUE OF THESE TESTS.—Three years' drilling followed by subsequent

dredging of the drilled tract, has proven that these tests are but fairly indicative of the values in the tract. For instance, one company, in order to prove the efficiency of these tests, drilled an acre of ground with 23 drill holes, which afterwards dredged within 95 p.c. of the calculated value. On the other hand, I have heard that a company with a recently finished modern dredge has already dredged out about six acres, which produced 35 p.c. of the drilled values (two holes to the acre). It is unfortunate that more exact data regarding the values of these tests are not at hand. Engineers will recognize the ever-present liability of error and consequent dissatisfaction arising from all work where the value of the large is calculated up from the value of the small. So the chief value of this method of testing ground lies not so much in proving the total possible yield of a piece of ground, or its values in sight, but in indicating the presence and occurrence of the pay channels, depth of bed rock, water level, etc., etc. It is now the custom to keep a driller well in advance of the dredge, the results of the drilled holes serving as a guide for its future movements.

## NEW COMPANIES.

## ONTARIO.

The Ontario Mining and Smelting Company.—Incorporated under the laws of the State of Maine, and licensed under the Statutes of Ontario, 2nd September, 1903. Authorized capital for use in Ontario \$20,000. H. F. Gann, M.E., Bannockburn, Ont., attorney. Formed to acquire the properties known as "The Ontario Mining and Smelting Company."

The Star of the East Gold Mining and Milling Company, Limited.—Incorporated under the Statutes of Ontario 23rd September, 1903. Authorized capital, \$1,500,000, in 1,500,000 shares of \$1 each. Directors: S. Sager, E. J. Cowain, A. O. Kidd, J. M. Fletcher, J. W. Sager. Head office, Peterborough, Ont. Formed to acquire the properties known as "The Star of the East Gold Mining and Milling Company, Limited."

The King Edward Oil Company, Limited.—Incorporated under the Statutes of Ontario, 18th September, 1903. Authorized capital, \$100,000, in 100,000 shares of \$1 each. Directors: J. R. McDowall, D. S. Robb, J. Houlden, J. Hutcheon, S. Howard. Head office, London, Ont. Formed to acquire the properties known as "The King Edward Oil Co., Limited."

The Eagle Lake Gold Mining Company.—Incorporated under the laws of the Territory of Arizona, and licensed under the Statutes of Ontario, 23rd September, 1903. Authorized capital for use in Ontario, \$50,000. J. B. O'Brian, Toronto, Ont., attorney. Formed to acquire the properties known as "The Eagle Lake Gold Mining Company."

Toronto Peat Fuel Company, Limited.—Incorporated under the Statutes of Ontario, 23rd September, 1903. Authorized capital, \$40,000, in 800 shares of \$50 each. Directors: A. A. Dickson, J. Brebner, W. S. Jackson. Head office, Toronto, Ont. Formed to acquire the properties known as the "Toronto Peat Fuel Company, Limited."

The Kipp Oil Company, Limited.—Incorporated under the Statutes of Ontario, 7th October, 1903. Authorized capital, \$150,000, in 1,500 shares of \$100 each. Directors: G. W. Kipp, E. F. Kizer, W. R. Hall, J. T. O'Keefe, J. F. O'Keefe. Head office, Chatham, Ont. Formed to acquire the properties known as "The Kipp Oil Company, Limited."

## BRITISH COLUMBIA

Perry Creek Hydraulic Mining Company, Limited.—Incorporated under the Statutes of British Columbia, 11th September, 1903. Authorized capital, \$1,000,000, in 1,000,000 shares of \$1 each. Formed to acquire the properties known as the "Perry Creek Hydraulic Mining Company, Limited."

Fisher Maiden Mining Company, Limited.—Re-incorporated under the Statutes of British Columbia, 15th September, 1903. Authorized capital, \$150,000, in 1,500,000 shares of ten (10) cents each. Formed to control the properties known as the "Fisher Maiden-Troy Mines, Limited."

## MINING NOTES

A special correspondent at Trail, B.C., writes as follows:—"On Wednesday, October 7th, a shipment of 85,000 ounces of silver 999 fine was made to the United States Government at San Francisco for shipment to the Philippines, which is the result of smelting British Columbia lead ores at Trail, and refining the resulting bullion by the electrolytic lead process, which has for many months past been supplying Eastern Canada with commercial pig lead.

When the electrolytic lead refinery was first operated, the "silver slimes" (composed of the precious metals and all the impurities, such as copper, antimony, arsenic, etc.) were sold to the United States refineries, where the actual separation of the precious metals from the impurities was made. As there were no plants in operation prepared to economically handle this particular product, which differs somewhat from the slimes produced from electrolytic copper refining, it was decided to build a special plant at Trail for the purpose of making a complete separation of the precious metals and impurities, which will make, in connection with the electrolytic lead process and the smelting works, a complete works for the treatment of all lead-silver ores and the production therefrom of pure lead, fine silver, fine gold, copper sulphate, and probably later, metallic antimony.



The first shipment of about 300 ounces of gold which was over 995 fine was made to the United States Assay Office at Seattle, and a second shipment of about 700 ounces of gold was made on Friday to the same place.

As Canada is now in a position to produce steadily fine gold, the Canadian Government should certainly take steps immediately towards purchasing this gold at whatever point it may be produced and so save the Canadian producers the cost of shipping and selling it to the United States Assay Offices.

It is believed that the above shipments of fine gold, or refined gold to the United States Assay Office, and silver brick to the Philippines, are the first which have ever been made as the result of smelting and refining ores in Canada.

The Canadian Smelting Works, Trail, are therefore in a position to supply Eastern Canada with whatever pig lead they may require, fine gold ready for minting purposes, fine silver, copper sulphate for use in Manitoba and the North West Territories, and will in a few months be turning out metallic antimony which will be used in making various babbitt metals."

**Arlington Mine (Erie) Trail District, B.C.**—During the month of September there were shipped five carloads of ore to the Hall Mines Smelter, Nelson. The net smelter returns were \$5341.95 being an average of over \$1000, a carload. The expenses in Canada for the month were \$4322.03, leaving a profit of \$1003.64.

**Tilt Cove Copper Co., Limited.**—The Fifteenth Ordinary General meeting of this company was held in London, England, at No. 9 Queen Street Place, on the 22nd inst., for the purpose of receiving the Report and Accounts to December 31st 1902, and for transacting the ordinary business of the company. Two members of the Committee of Management whose term of office had expired under the Articles of Association, but who were eligible were re-elected, viz., Mr. E. A. Berthoud and Mr. E. C. Leaver. Messrs. Deloitte, Dever, Griffiths & Co., were re-elected as auditors for the current year.

**Zenith Zinc Mine.**—This mine situated on mining location 30-T, in the District of Thunder Bay, Ont., and formerly the property of the Grand Calumet Mining Co., was sold on the 6th inst. by public auction to Mr. Nelson D. Porter, of Ottawa, in the office of Wm. L. Scott, local master and deputy registrar, Court House. Bidding was principally between Mr. Poupore, Montreal, and Mr. Porter, and started at about \$7,000 and stopped at a little over \$20,000, and as the reserve bid had not been reached Mr. Scott declared the sale off. A little later Mr. Porter submitted a written tender of \$21,000, which was accepted. The mine is situated about twelve miles from Rockland on the C.P.R. The sale included besides the mine a considerable quantity of mining machinery.

**Rossland Ore Shipments.**—The details of the shipping operations from Rossland Camp for the week ending October 17th, 1903, are as follows:—

|                        |       |
|------------------------|-------|
| Le Roi.....            | 5,160 |
| Centre Star.....       | 1,501 |
| War Eagle.....         | 1,050 |
| Le Roi, No. 2.....     | 480   |
| Jumbo.....             | 125   |
| Spitzee.....           | 60    |
| I. X. L. (milled)..... | 200   |

Total week 8,576. Year to date 313,354 tons.

**Western Fuel Company.**—A western exchange states that this company which is operating the coal mines at Nanaimo, Vancouver Island, gives unmistakable evidence that the new workings at Departure Bay are proving satisfactory, and that operations are to be carried on steadily there. The company has made a proposition to the City Council to extend the water mains to the new works, and provide sufficient water for four boilers. The company agrees to enter into a contract for a supply of water for five years. There is no doubt that the Coal Company intends to ship from Departure Bay, as an arrangement is sought by which water may be supplied to vessels coming to the Northfield wharf.

**Granby Consolidated.**—A Montreal despatch of the 8th inst. says:—At the annual meeting of the Granby Consolidated Mining, Smelting & Power Company, Ltd., held at the company's office, Canada Life Building, in this city, the old Board of Directors were elected as follows: S. H. C. Miner, Jay P. Graves, John Stanton, William H. Nicholls, A. C. Flumerfelt, A. L. White, W. A. Robinson, Jacob Langeloth, J. H. McKechnie, George Martin Luther, Fayette Brown and C. S. Houghton.

When the financial statement was presented it showed the company to be free from debt with the exception of the ordinary monthly bills. The production for the year ending June 30th, 1903, amounted to 12,511,000 pounds of fine copper, 277,000 ounces of silver, and 35,121 ounces of gold, for which was received the sum of \$2,232,741, while the rents and real estate sales brought in \$38,511, making a total of \$2,371,252.

**Snowshoe Gold and Copper.**—Rumors are current in London that the amalgamation of the Snowshoe Gold and Copper Mines, Limited, and the B. C. Copper Company is being arranged. The former company is a subsidiary company of the B. C. (Rossland-Slocan) Syndicate operating the Snowshoe property in the Boundary District of British Columbia, and is now shipping an average of 2,000 tons a week. The B.C. Copper Company owns the Mother Lode Mine, and also an extensive smelting plant at Greenwood, which at present is running two blast furnaces, and will shortly install a copper converter.

**The Winnipeg Mine.**—The annual general meeting of the Winnipeg Mines, Ltd., was held at the mine, near Phoenix, on the 6th inst., when the following officers were elected: President, John Dean, of Rossland; vice-president, C. D. Hunter, of Phoenix; secretary-treasurer, Richard Plewman, of Phoenix; also W. W. Gibbs, of Portland, R. E. Plewman and F. W. Bauer, of Rossland, and J. A. Morrin, of Phoenix.

## CONCENTRATES.

**SLATE AND MARBLE INDUSTRIES IN VERMONT**—For a number of years past the United States Geological Survey has carried on work in the slate and marble districts of Vermont. Prof. T. Nelson Dale, who is in charge of this work for the Survey, prepared a very complete report on the slate beds of Vermont and New York a few years ago. This report was published in the annual report of the Director of the Survey, and proved to be of such value and interest to quarrymen and others that the edition was soon exhausted. It is probable that a portion of this report will be republished early in 1904 as part of a report on the slate industry of the United States. Investigations of the marble deposits of Vermont have also been carried on by the Survey, and Professor Dale is preparing a report on this subject.

Gold Commissioners in British Columbia give notice that placer mining claims are held over as follows: Cariboo, from November 1st to June 1st, 1904. Kamloops, Ashcroft, Yale and Similkameen, from November 1st to May 1st.

The B.C. Review, published in London, England, publishes the following in its issue of the 17th inst.:—“During the progress of the Commission which has been recently sitting at Dawson to investigate the question of hydraulic concessions in general, and that granted to Mr. A. N. C. Treadgold in particular, he is reported to have stated that if a clear title is given to him under the terms of his concession, over £800,000 will be expended in a waterworks scheme for supplying the mines. There appears to be an impression in the Yukon that this money will be found in London, but we may state that there is not the least possibility that any such sum could be raised here for such an object. We have hitherto been under the impression that any financial backing Mr. Treadgold may have obtained came from Chicago. The results which have so far attended the investment of British capital in the Klondike have not been such as would enable even one issuing house of repute to find one quarter of the sum mentioned for any concession in that country.”

Speaking of concessions of water rights the following is taken from *South African Mines*, a leading mining paper published in Johannesburg, S.A., in its issue of September 26th:—“In his speech on Saturday last His Excellency the Lieut-Governor hinted at the policy of the Government in regard to water-rights. He announced that the Government propose to introduce an ordinance vesting the water of the principal streams of the colony in the Government. Reference to the letter of the Registrar of Mining Rights, printed hereafter, will further elucidate the remarks of His Excellency. Water-rights under the present mining law are most unsatisfactory. The fees exacted for power rights are prohibitive and iniquitous, and are to be abolished. Cancellation of water-rights is virtually impossible under the existing law if the holder chooses to pose as a dog in the manger. A salutary change proposed is the removal of the restriction of the grant of a water right to the holder of a properly developed digger's claim. This provision has operated toward the creation of monopoly, and the grant of water for development purposes will be a relief. Water-rights are, therefore, to be granted for a period in connection with mining rights subject to proper uses.”

The Mount Morgan mine, said to be Australia's oldest and greatest gold mine, paid last year \$750,000 in dividends. The annual report for the fiscal year shows the following figures regarding production: Ore treated, 262,819 tons; gold produced, 143,584 ounces, which was 4.044 ounces less than the gold production of the previous twelve months, when 29,866 less tonnage was milled. The mundic ore treated during the year was fifty-two per cent. The average return from all of the ore dealt with during the year was nearly 11¼ dwt., of the value of 45s. 6d., while the cost of mining and treating averaged 21s.

Stream tin was discovered in Alaska last year, and now it is reported that great ledges of tin ore have been found at Cape York, on Behring Sea. Numerous individual placer mines are reported to have made small fortunes during the past summer; two men, for example, having taken twenty-two tons of stream tin from claims along one of the creeks in the Cape York region, using the crudest hand methods. Hydraulic machinery will be taken into the district next season, when the extent and value of the tin deposits will be ascertained.

The history of the cyanide process is as follows: In 1806 it was known that gold was soluble in potassium cyanide. In 1884 Eloner published the results of his investigations and gave his well-known equation. Faraday used the solvent effect of cyanide to reduce the thickness of gold films. About 1885 Messrs. McArthur and the Forrests of Glasgow commenced their investigations, and in 1888 the cyanide process was tried in New Zealand and proved to be a success. The year following the process was introduced into South Africa for the purpose of treatment of tailings. It was a great success, and the process has spread into every gold mining district. Between 1844 and 1888 many experiments were made to use potassium cyanide as a commercial solvent for gold but without success. The Messrs. McArthur and Forrest are entitled to the credit of the greatest improvements in metallurgy made during the last twenty-five years.

The announcement comes from Germany that a Frenchman, Edward Mollard, has reported to the state department the discovery of another metal. This new metal is called selium and is both lighter and stronger than aluminum. Its hardness is not quite equal to iron, but is greater than zinc, and its power of resistance ranks between iron and steel. The greatest advantage of the new metal is its cost of production, which is only about one-twentieth that of aluminum. Selium does not corrode and is capable of a very high polish. The former quality is an important requisite in ship-building, while the latter makes the new metal exceptionally suited for cooking utensils.

Rich gold field have been discovered about 160 miles west of the city of Oaxaca, Mexico, and 122 miles from the town of Ejutla. The ore found is said to assay up to \$50,000 a ton, and so great is the excitement that cavalry has gone to guard the claims. The ledge is said to be a fifteen feet wide.



A monster nugget of silver weighing more than a ton, the largest single piece of silver ore ever taken from the ground, will be one of the features that the state of Idaho will display at the St. Louis Exposition. This is interesting to British Columbians, in as much as the nugget comes from a mine just across the border from the richest silver district in Canada.

Efforts are being made to still further develop the manganese ore mining industry in the Caucasian district of Russia. To this end two large banks, with the authority of the Government, are about to establish offices near the mines, for the purpose of making advances on ore and undertaking the sale of the same through their agents abroad.

Estimates of the iron ore area of the United States—made for the Wall Street Journal by the United States Geological Survey—place the total at 18,000 square miles. Of the aggregate it is estimated that the Lake Superior area, comprising at least 95 per cent. of the Bessemer iron ore supply, includes not less than 9,000 square miles, and the total may be a little more. The total shipment of Lake Superior ores in 1902 was 27,571,121 tons, of which the United States Steel Corporation produced 16,174,473 tons or 58.6 per cent. of the whole.

There have been found on the west arm of Quatsino Sound, Vancouver Island, B.C., immense deposits of limonite and bog iron, by two prospectors Messrs. Hick and Frank. These deposits were found late last year, and for various reasons the find was kept secret. Considerable development having recently been done on the property, therefore assuring the owners that it is in reality a rich deposit of hematite.

The Comstock lode has produced \$320,000,000; the Calumet has paid \$80,800,000 in dividends; the Anaconda, sold for \$40,000,000 to the Rothschilds, paid that amount in dividends before the sale; the Ontario has paid \$14,000,000 in dividends; the Homestake has paid \$3,333 in dividends every working day in the last ten years; the Granite rose in two years from 10 cents a share to \$75 and pays 50 per cent. in dividends every month. Mining is indeed a fine business when you hit it rich.—New York Press.

During the shutdown at the Broken Hill mines, in N. S. W. Australia on account of the want of sufficient water caused by the long continued drought, a bibulous miner drank so much cocculus, indicus, and sugar at the local beer houses as to get delirium tremens. He had a mate to whom he went daily for sympathy and threepences. Finally this mate got tired of the drunkard's woes. "Oh, go and drown yourself!" he said, hotly. "Great Scott!" was the reply; "I never thought of that"; and the alcoholic miner rushed away to find a suitable spot. Needless to say, he was miserably unsuccessful; and at last advised he was still unbooming and borrowing.

#### Lead Shipments of B.C.

Lead shipments in British Columbia from 1887 to 1902 inclusive are reported by Mr. Macpherson, M.P., for Burrard to have been as follows:—

|           |           |           |            |
|-----------|-----------|-----------|------------|
| 1887..... | 204,800   | 1895..... | 16,475,464 |
| 1888..... | 674,500   | 1896..... | 24,199,977 |
| 1889..... | 165,100   | 1897..... | 38,841,135 |
| 1890..... | nil.      | 1898..... | 31,693,559 |
| 1891..... | nil.      | 1899..... | 21,862,436 |
| 1892..... | 808,420   | 1900..... | 63,358,621 |
| 1893..... | 2,135,023 | 1901..... | 51,582,906 |
| 1894..... | 5,662,523 | 1902..... | 22,536,381 |

The consumption of lead in Canada during the last year mentioned (1902) was about 24,000,000 pounds.

#### A New Gold Dredge.

From a western exchange comes the information that a new style of gold dredge is being built in Seattle by the Washington Iron Works and the Puget Sound Machinery Depot for the use of the Bachman Gold Dredging Co. of Pasadena, Cal., on streams in the Mount Baker District, State of Washington. It is claimed for the proposed dredger that its construction and operation is to be on lines entirely new in subaqueous gold mining. The following particulars may be of interest to those of our readers engaged in this branch of the Canadian mining industry.

The mechanism of this dredge is unique, a combination of the well-known chain bucket system and a powerful direct-action plunger pump. The pump is especially designed for pumping granular matter, and is the invention of James Bewsher, of this city. The chain buckets will be operated to bring the boulders and coarser gravel to the surface, where they are disposed of, while the fine sand, gravel and gold are all taken in through the suction pipes and delivered to the sluice boxes on board the dredge. It is claimed for this pump that it will lift and carry gold in any form in suspension as easily as it pumps fine sand, and that it will save all of the bed-rock gold, practically all of which is now lost under the old method of bucket dredging. The most interesting feature in this new departure in mechanics is the fact that the granular matter is passed through the chambers of the pump without injury to the plungers or other wearing parts. As a dredging pump for all purposes great efficiency is claimed for it over the centrifugal pattern now in general use.

## Mica Properties for Sale

Address

GEO. S. DAVISON

P.O. Box 1069

OTTAWA, ONT.

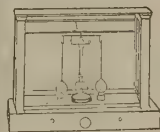
POGSON, PELOUBET & CO.

## PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

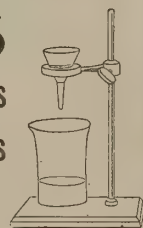
Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



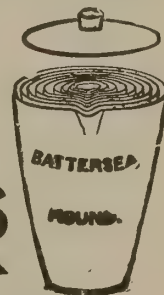
The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

## COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

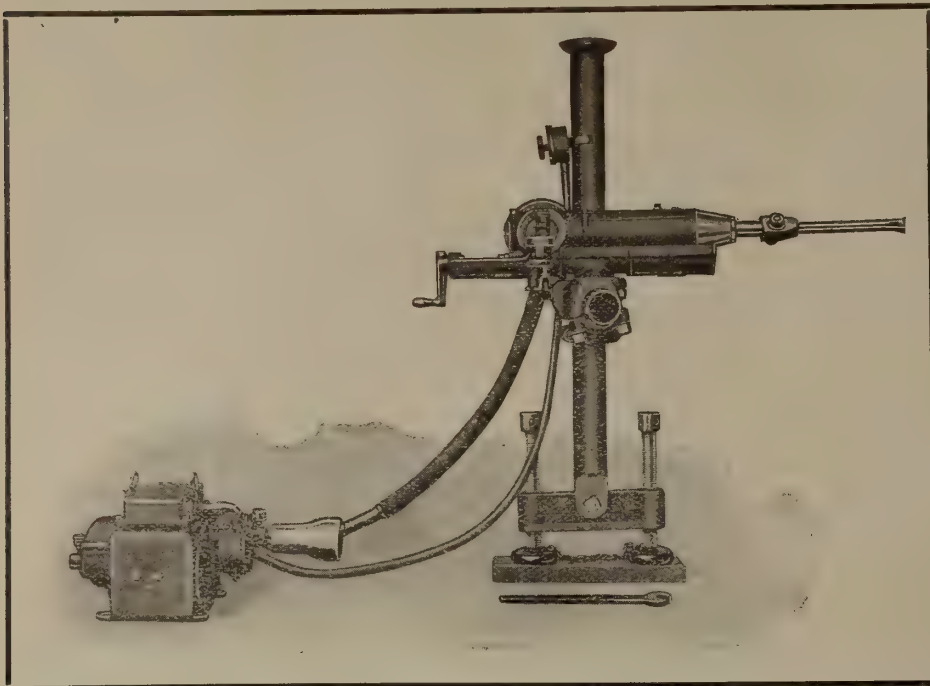
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.





# THE GARDNER ELECTRIC ROCK DRILL

A Mechanical Drill Electrically driven.  
It requires less Horse Power to operate  
than Air or Steam.  
No Pipes to install.  
Highest possible efficiency.

Write for descriptive Pamphlets.  
They will interest you.

## THE R. E. T. PRINGLE CO. LIMITED ELECTRICAL APPARATUS AND SUPPLIES

BRANCH OFFICES:

St. John, N.B. Toronto, Ont.

Head Office and Factory:

MONTREAL, P.Q.



### ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

#### THE CANDA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

### CHROME STEEL WORKS, BROOKLYN, N.Y., U.S.A.

KENT AVENUE, KEAP  
AND HOOPER STREETS.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.



TIGER

PIONEER

CROWN

APOLLO

MARINE

MIAMI

CHAMPION

**GREASE CUPS**

Use Grease or Oil and Lunkenheimer Cups and you will have bearings lubricated to your entire satisfaction. Endorsed by millions of satisfied users. Specify them and order from your dealer. Write for catalog of Brass and Iron Engineering Appliances of superior quality.

**THE LUNKENHEIMER CO., Cincinnati, O.**

BRANCHES: NEW YORK: 26 Cortlandt Street.  
LONDON: 35 Great Dover Street, S. E.

**OIL CUPS**

GEM

JEWEL

SENTINEL

ROYAL

IDEAL

PRESSURE

LION

**C. L.  
BERGER  
& SONS**

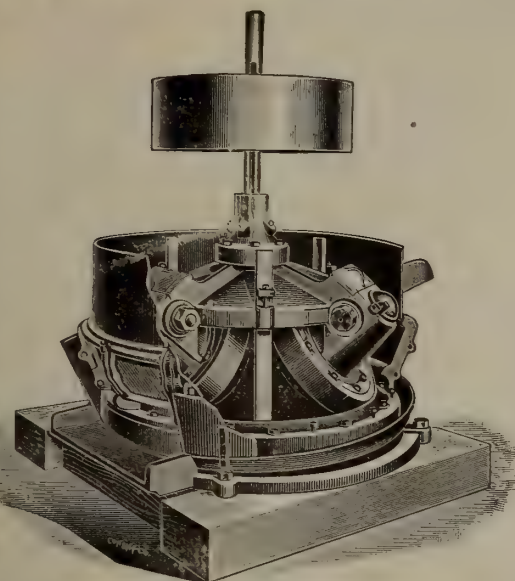
37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.

SPECIALTIES:  
Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

**F. E. LEUSHNER,**  
Room 12, Janes Bld., TORONTO, Canada.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO.,** 52 Broadway, New York

Manufacturing Agents for Canada, **ROBERT GARDNER & SON,** Montreal, P.Q.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.



CABLE  
HOIST-  
CONVEYORS

Cable Hoist-Conveyor,  
Built for the U. S. Government,  
at Lamoille, Minn.

MANUFACTURED BY  
**THE TRENTON IRON CO**  
TRENTON, N. J.

ENGINEERS AND CONTRACTORS AND SOLE LICENSEES IN NORTH  
AMERICA FOR THE BLEICHERT SYSTEM OF WIRE ROPE TRAMWAYS, ALSO  
WIRE ROPE EQUIPMENTS FOR SURFACE AND UNDER GROUND HAULAGE  
ILLUSTRATED BOOK UPON APPLICATION.

Chicago Office—1114 Monadnock Building.



# J. & J. TAYLOR

(TORONTO SAFE WORKS)

TORONTO, ONTARIO

MANUFACTURERS OF

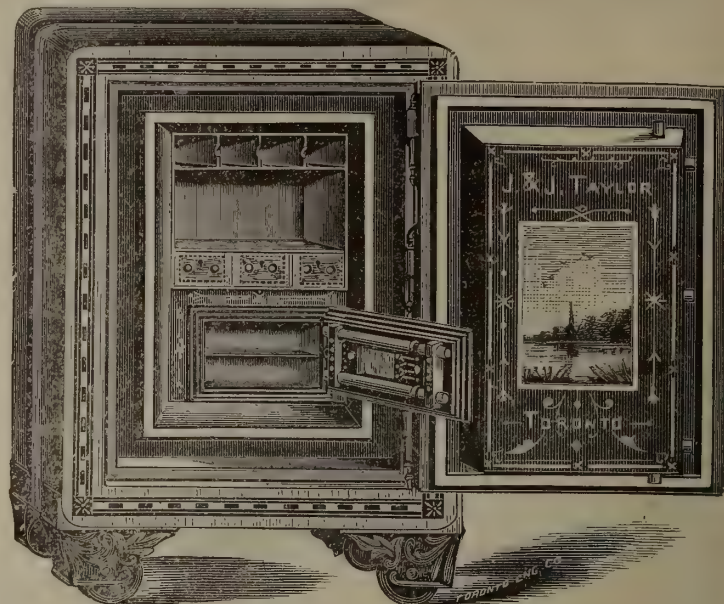
Bankers' Steel Safes

Fireproof Safes

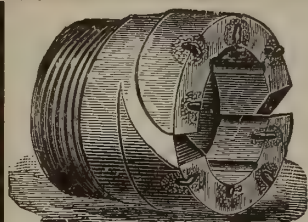
Jewellers' Safes

Vault Doors

Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

**BERNARD BANDLER**

IMPORTER OF

**CARBONS AND BORTS**

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



## LAURIE ENGINE COMPANY

MONTREAL - - CANADA

# IMPROVED

# CORLISS

SIMPLE

COMPOUND

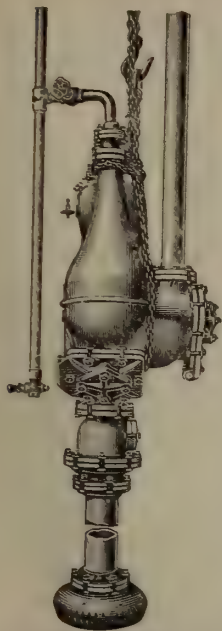
VERTICAL

HORIZONTAL

# ENGINES

FOR ELECTRIC LIGHT and POWER PLANTS.





# The Pulsometer.

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

NOISELESS. NOT AFFECTED BY WEATHER.

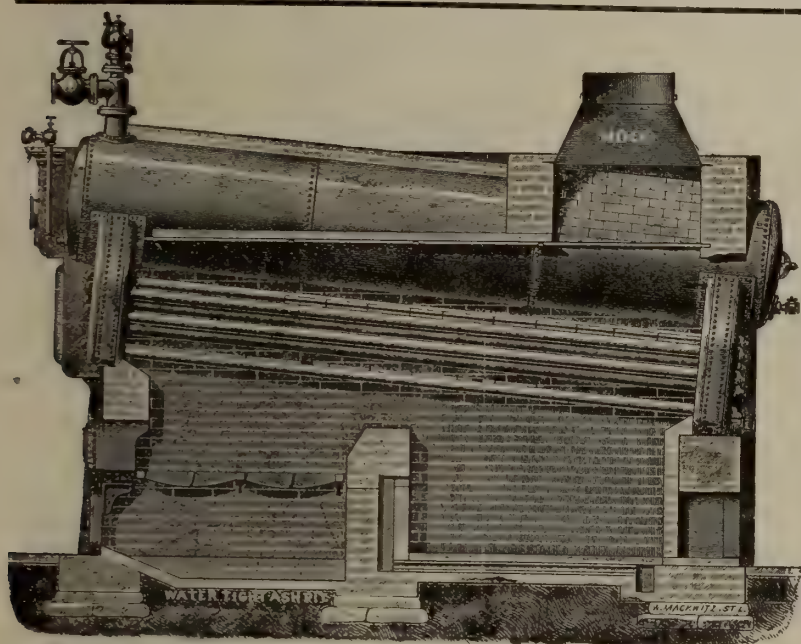
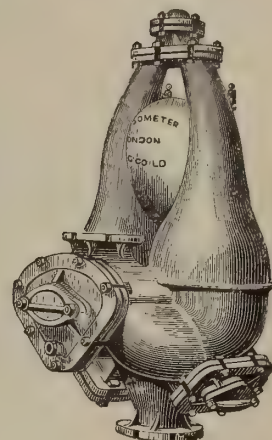
NO SKILLED LABOR REQUIRED.

MOST ECONOMICAL AND BEST MADE.

NO EXHAUST STEAM. SIMPLE. DURABLE.

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL



## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON."

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

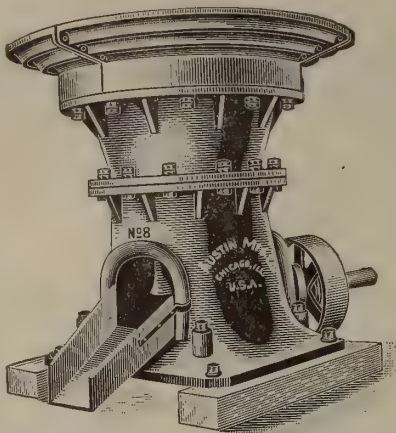
Head Office: 107 ST. JAMES STREET, MONTREAL

Address: P. O. BOX 396.



THE  
"AUSTIN"

IS THE ONLY  
AUTOMATICALLY  
LUBRICATED  
CRUSHER  
ON THE MARKET  
AND EMBODIES  
MANY OTHER  
SPECIAL  
PATENTED  
IMPROVEMENTS.



THE  
"AUSTIN"

RANGES IN  
CAPACITY FROM  
40 TO 2,000 TONS  
PER DAY  
AND IS THE  
MOST DURABLE  
AND  
EFFICIENT  
CRUSHER FOR  
MINE OPERATORS

# CRUSHERS

ELEVATORS, SCREENS, ETC.

## W. H. C. MUSSEN & CO.

763-765 Craig St.

MONTREAL

ESTABLISHED 1837

**WIRE ROPE** OF EVERY DESCRIPTION FOR MINES, QUARRIES, ELEVATORS, DREDGES, SAW MILLS ETC.

**AERIAL WIRE ROPE TRAMWAYS** SINGLE & DOUBLE ROPE SYSTEMS

**ALESCHEN & SONS ROPE CO.**

BRANCH OFFICES: NEW YORK, CHICAGO, ST. LOUIS, MO., DENVER, CO., SAN FRANCISCO, CALIF.

DEPOT: 101 N. BROAD ST., NEW YORK, N.Y.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

**4 TRAINS DAILY**  
EXCEPT SUNDAY **4**

And Sunday Train Both Directions

PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit. For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

**E. J. CHAMBERLIN,** Gen. Traffic Manager.

**C. J. SMITH,**

**W. P. HINTON,** Gen'l Passenger Agent.

**J. E. WALSH,** Ass. Gen. Passenger Agt.

## EIGHTH MONTHLY DIVIDEND, Feb. 15th

WILL BE PAID BY THE

California-Nevada Mining Co.

# 60% PER ANNUM GUARANTEED

on Par Value of Stock when Mill is completed.

PRESENT DIVIDEND 1 PER CENT. PER MONTH ON PAR VALUE UNTIL MILL IS COMPLETED.

\$20,000,000 BLOCKED OUT READY FOR THE MILL and the Hoodlum Claim, which adjoins the Old Victor Mine, yet to figure on.

A 200-TON PER DAY PLANT CONTRACTED FOR and will be in full operation not later than April 1st, 1903.

PRESENT PRICE \$1.00 PER SHARE. Fully paid and non-assessable.

Do not fail to investigate this proposition, for the more you investigate the more stock you will want. Write for prospectus.

**W. H. BALDWIN & CO.,** Brokers and Financial Agents 49-50-51-52 VOLCKERT BLDG., ALBANY, N.Y.

REFERENCE—Bradstreet's and Dun's Agencies; State Bank and Trust Company, Los Angeles, Cal.; any mining journal of the state or prominent mining men.



# Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

## AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central-reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

## MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works, mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

## SUBSCRIPTION.

Members yearly subscription.....\$10 00  
Student Members do ..... 2 00

## PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

**B. T. A. BELL,** Secretary,  
Orme's Hall, Ottawa





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

{Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,

PARLIAMENT BUILDINGS, QUEBEC, P. Q.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite ; copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**  
Commissioner Public Works and Mines,  
HALIFAX, NOVA SCOTIA.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

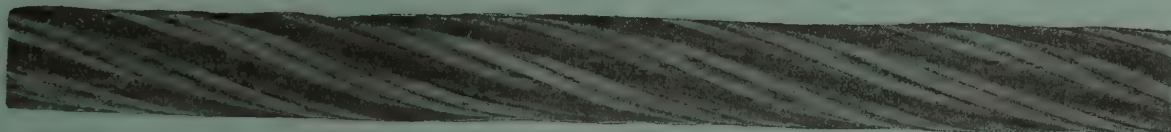


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

## Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steam Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

## Montreal Pipe Foundry Co. Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

# PIPE

and other Water Works Supplies.

"LUDLOW" VALVES & HYDRANTS

GENERAL OFFICES:

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

CANADA IRON FURNACE COMPANY, LIMITED

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

CANADA LIFE BUILDING, MONTREAL.

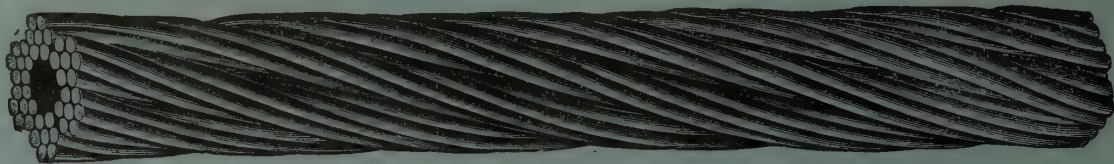
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

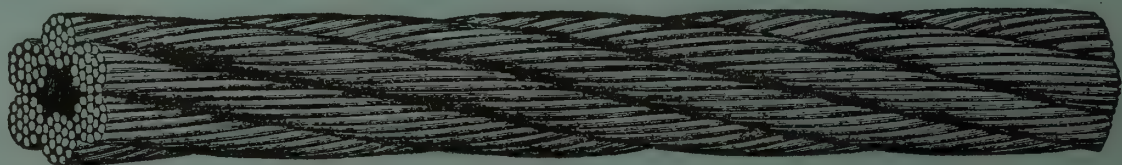
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**COOPER**

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. XI.

OTTAWA, NOVEMBER 30th, 1903.

Vol. XXII—No. XI.



**AIR  
COMPRESSORS  
GAS**

**THE CANADIAN RAND DRILL CO**  
**SHERBROOKE, QUE.**  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



**ROCK  
DRILLS**



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited

# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

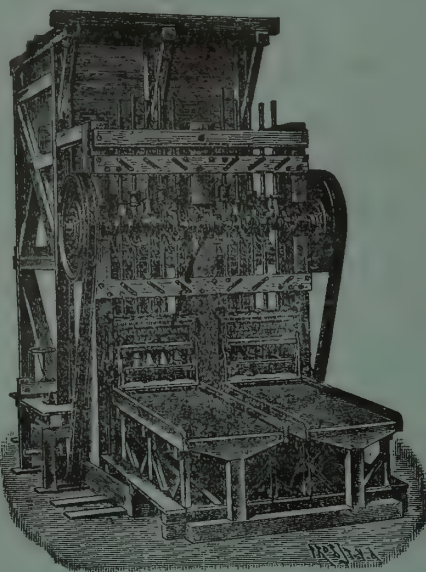
ROSSLAND, P.O. Building.



# FRIED. KRUPP AKTIENGESELLSCHAFT GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- a. For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- b. For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 540, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

Agents:

# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. GARTSHORE, 83 Front Street West  
Opposite Queen's Hotel TORONTO, ONT.

## MINING EQUIPMENT, Etc.

## Modern Mining Machinery

We have all the latest improvements in this class of machinery, and have a thoroughly up-to-date plant for the manufacture of same.

### The WILFLEY CONCENTRATOR

We are sole Canadian manufacturers of this famous Concentrating Table and have installed it in a great many of the largest plants in Canada.

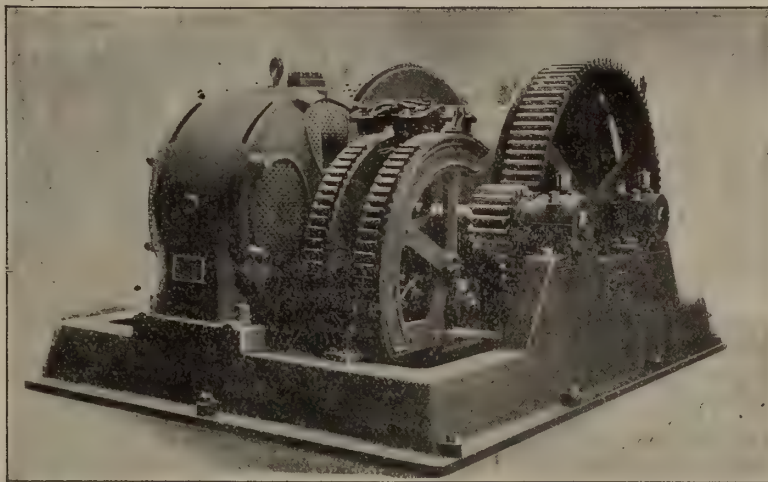
We also build the **Samson** turbine water wheel which is peculiarly adapted for mining purposes.

Write for further information

The Wm. Hamilton Mnfg. Co. Limited  
Peterborough, Ont.



# Westinghouse Induction Motors



Westinghouse Induction Motor Geared to Mine Hoist.

Their sparkless operation renders them particularly adapted for use in mines where inflammable gases are dangerous.

For particulars, address nearest office of

## Canadian Westinghouse Co. Limited.

Lawlor Bldg. King and Yonge Sts.  
Toronto.

Works : Hamilton, Ontario.

Liverpool and London & Globe Bld.  
Montreal.

HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

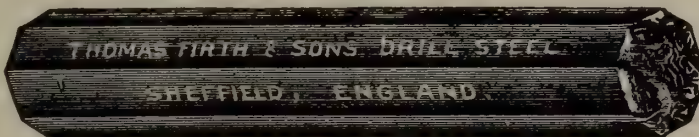
PEACOCK BROTHERS, Canada Life Building, MONTREAL.

## THOS. FIRTH & SONS, Ltd., Sheffield, Tool Steel and Rock Drill Steel

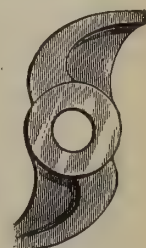
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



GAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES.



### H. W. DeCOURTENAY & CO.

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.



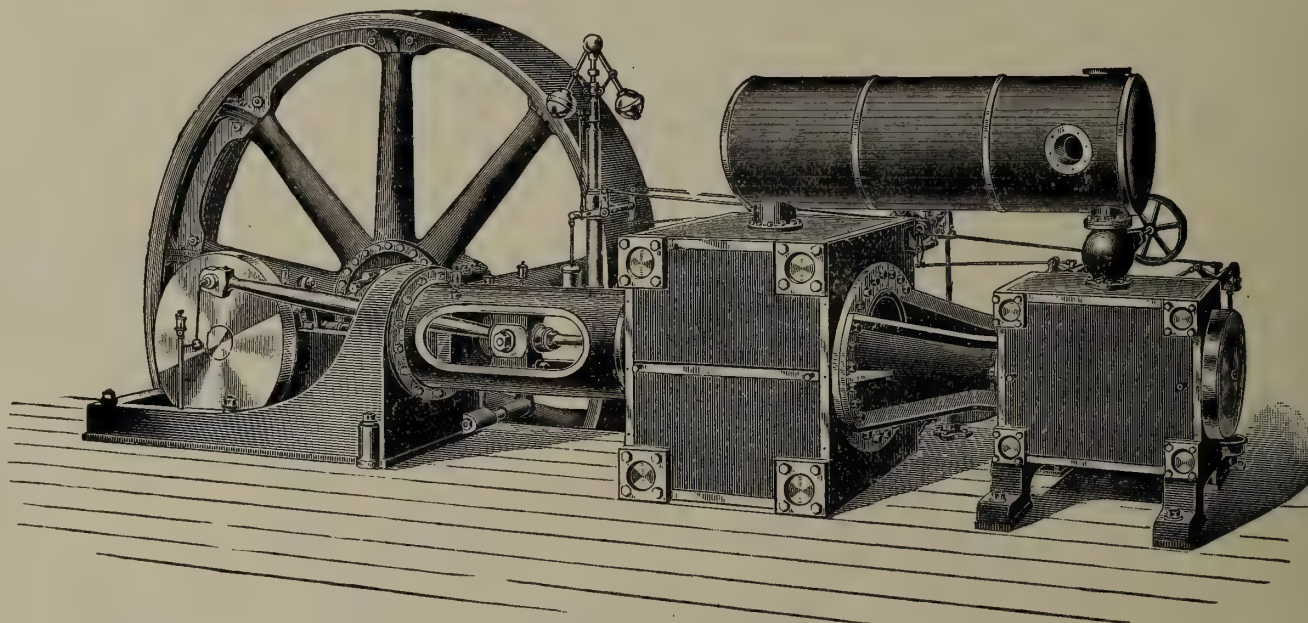
# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'F'G CO.,  
SCRANTON, PA.

## SOLE BUILDERS OF Reynolds Corliss Engines

BUILT IN ALL STYLES AND SIZES  
ESPECIALLY ADAPTED FOR MINING PURPOSES



REYNOLDS CORLISS TANDEM COMPOUND ENGINE

**T**HE Reynolds Corliss Engine, designed and built by Allis-Chalmers Company, is recognized as one of the most successful examples of steam engineering, there being upwards of 6,000 Reynolds Corliss engines in use in this and foreign countries. It is the policy of the Allis-Chalmers Company to make each engine sold a complete success from an engineering and commercial standpoint, and to this end it has employed the best obtainable talent, that, with unequalled facilities for manufacturing, has made the enviable reputation this engine enjoys. The greater number of mining companies throughout the civilized world are using our engines.

Complete steam plants equipped.

**BRANCH OFFICES:**

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

**GENERAL****CHICAGO,**

LONDON, ENG., 533 Salisbury House

**OFFICE****ILL., U.S.A.**

JOHANNESBURG, South Africa

**BRANCH OFFICES:**

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Heenan Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# ALLIS-CHALMERS CO.

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

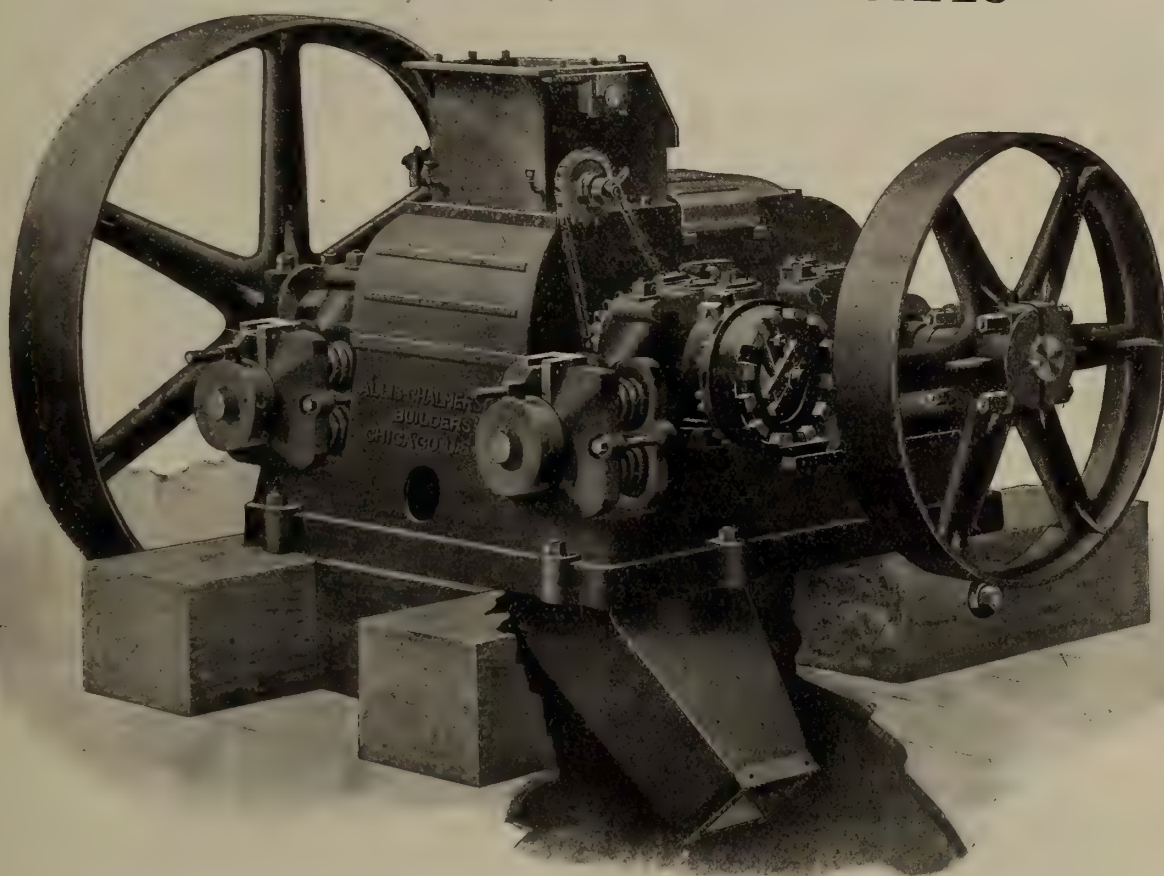
GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

...BUILDERS OF...

## High-Grade Crushing Rolls

IN MANY STYLES AND SIZES



These rolls represent the most modern and highest grade of construction in crushing machinery of this type, being designed and built on the same grade as an engine or electric generator. They are suitable for either wet or dry crushing and are built in sizes 36" x 15" and 26" x 15". We also build several other styles and sizes of rolls. Send for special descriptive catalogue.

*Builders of* **BLAKE AND DODGE CRUSHERS**

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

### GENERAL

**CHICAGO,**



### OFFICE

**ILL., U.S.A.**

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

### BRANCH OFFICES:

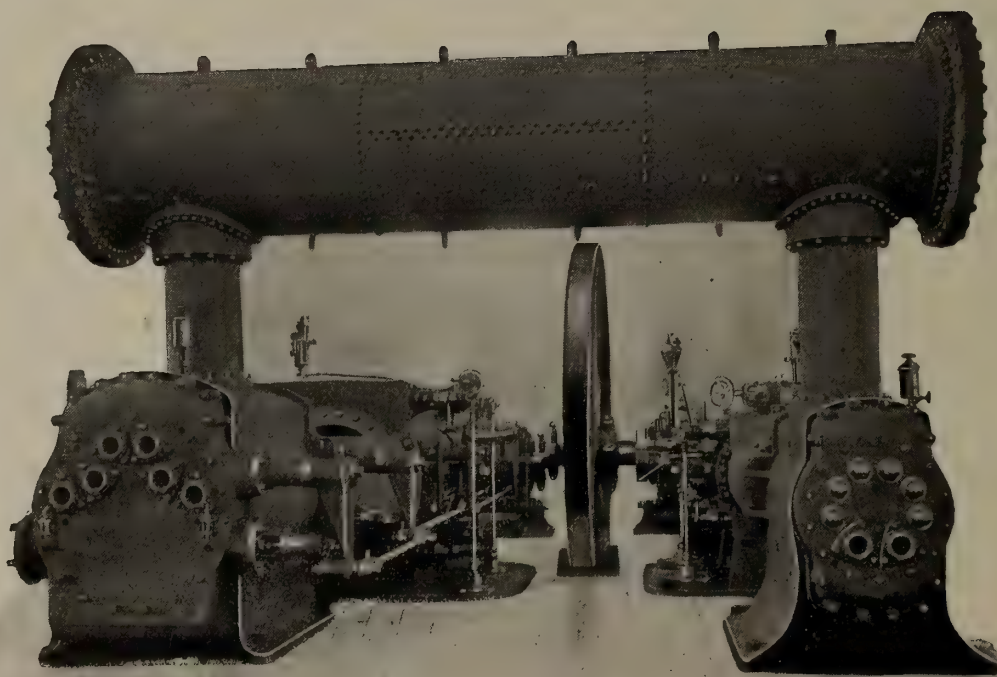
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE

Crown



Brand

## The Popular Fuse Throughout the Dominion

SOLE MANUFACTURERS

### WM. BENNETT SONS & Co.

ROSKEAR SAFETY FUSE WORKS

Camborne, Cornwall, England.

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

MECHANICS SUPPLY CO., Quebec.

CAVERHILL, LEARMONT &amp; CO., St. Peters St., Montreal.

WM. STAIRS, SON &amp; MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-  
ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :-

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

## THE HAMILTON BRASS MFG. CO., Limited.

HAMILTON. ONT.



# INGERSOLL-SERGEANT MACHINERY

Rock Drills  
Air Compressors  
Coal Cutters

The **I-S** COAL CUTTER

H 4



Is the most popular and extensively used  
COAL PUNCHER in NORTH AMERICA to-day.

It is easy on the operator, yet does the work. Light and strong.  
The economy of repairs is its recommendation with the superintendents, whilst economically it makes the most of every pound of pressure in the pipe line : : : : : :

BUILT FOR USE IN CANADA  
BY

## THE JAMES COOPER M'F'G CO. Limited

299 ST. JAMES STREET

MONTREAL, Que.



# LARGEST AIR COMPRESSORS IN CANADA

ARE OF WALKER BROTHERS MANUFACTURE

## Dominion Coal Company, Limited

### TWO COMPRESSORS

CROSS COMPOUND STEAM CYLINDERS, CORLISS VALVES

31" High Pressure, 57" Low Pressure

TWO STAGE AIR CYLINDERS, WALKER PATENT AIR VALVES

51" Low Pressure, 32" High Pressure, 60" Stroke.

## Belmont Gold Mine, Limited

TWO STAGE AIR COMPRESSOR, TURBINE DRIVEN WITH 30 COTTON ROPES 1 3/4" DIA.

48" Low Pressure, 30" High Pressure, 48" Stroke

WALKER PATENT AIR VALVES.

## Nova Scotia Steel and Coal Co. Ltd.

CROSS COMPOUND STEAM CYLINDERS, CORLISS VALVES

24" High Pressure, 46" Low Pressure

TWO STAGE AIR CYLINDERS, WALKER PATENT AIR VALVES

42" Low Pressure, 26" High Pressure, 54" Stroke.

## Intercolonial Coal Mining Co. Ltd.

CROSS COMPOUND STEAM CYLINDERS, CORLISS VALVES

23" High Pressure, 39" Low Pressure

TWO STAGE AIR CYLINDERS, WALKER PATENT AIR VALVES

35" Low Pressure, 22" High Pressure, 48" Stroke.

...MANUFACTURED BY...

# WALKER BROTHERS - WIGAN, ENGLAND

AIR COMPRESSORS, VENTILATING FANS,  
WINDING AND HAULING MACHINERY, Etc.

SOLE CANADIAN  
REPRESENTATIVES

## PEACOCK BROTHERS

CANADA LIFE BUILDING  
MONTREAL



# J. Bertram & Sons Canada Tool Works,

DUNDAS, ONT.

Builders of Iron

• • • • WORKING MACHINERY

.... FOR ....

REPAIR SHOP, MACHINE SHOP, SHIP YARDS  
BOILER SHOPS, ENGINE WORKS,  
CAR SHOPS, FORGE WORKS.

OUR EQUIPMENT AND WORKS ARE THE LARGEST IN CANADA.

OUR LINE OF

## MACHINE TOOLS

WILL SUPPLY A SHOP COMPLETE.

MONTREAL  
... STORE: 321 St. JAMES STREET.

B.C. Agency: The Wm. Hamilton Mfg. Co., Vancouver, B.C.

Full Information obtained at the Above Addresses. Write for Prices.

LONDONNEW YORKPARIS

J. BASZANGER &amp; CO.

108 FULTON ST., NEW YORK, N.Y., U.S.A.

IMPORTERS OF

# CARBONS

 (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



Finest Quality and Shapes at Lowest Prices.

Goods Sent on Approval.

WORN OUT CARBONS AND FRAGMENTS BOUGHT.

# DIAMOND DRILLS

They remove solid cores through rock for prospecting.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

# STANDARD DIAMOND DRILL CO.

431-5 STOCK EXCHANGE BUILDING, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{2}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

**Steel Works and Head Office : NEW GLASCOW, N.S.**



# DIAMOND

## DEEP DRILLING

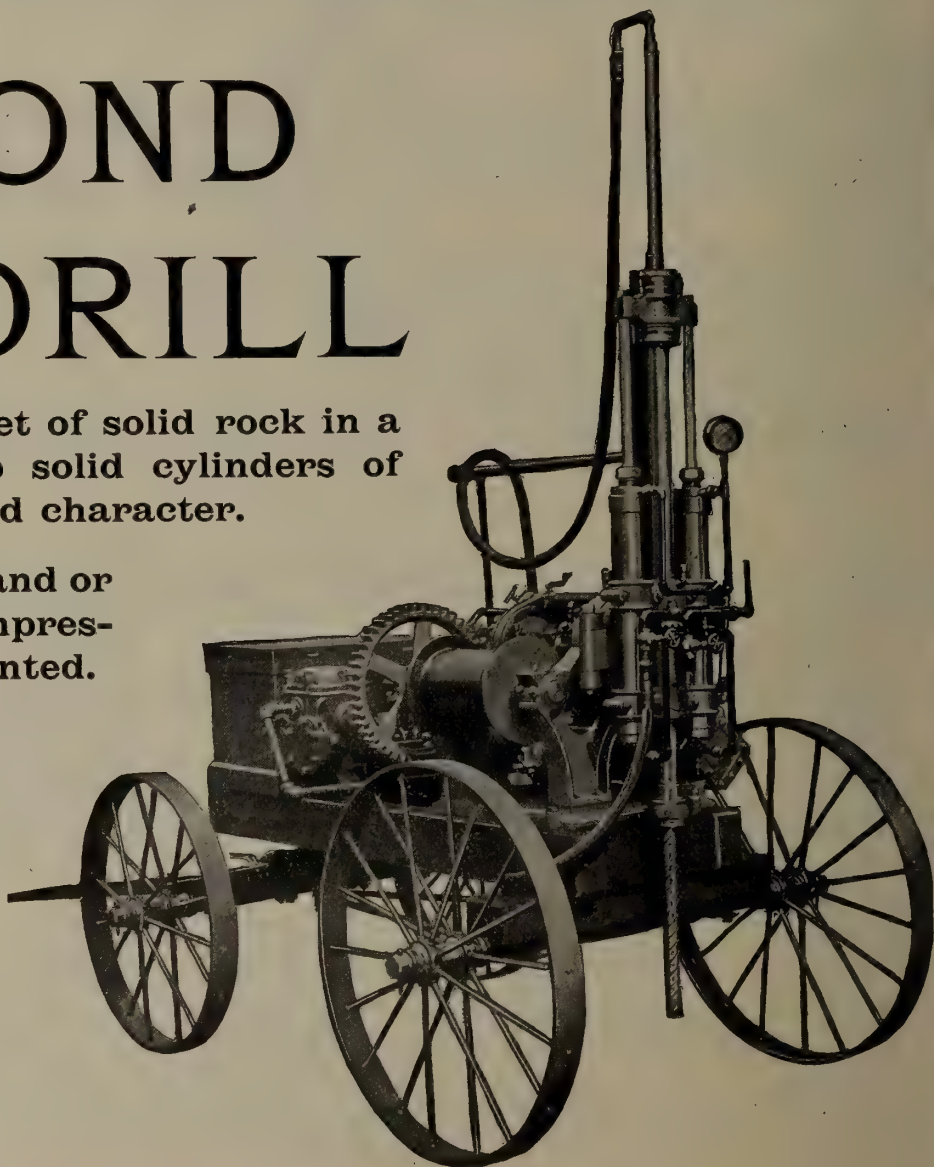
makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS

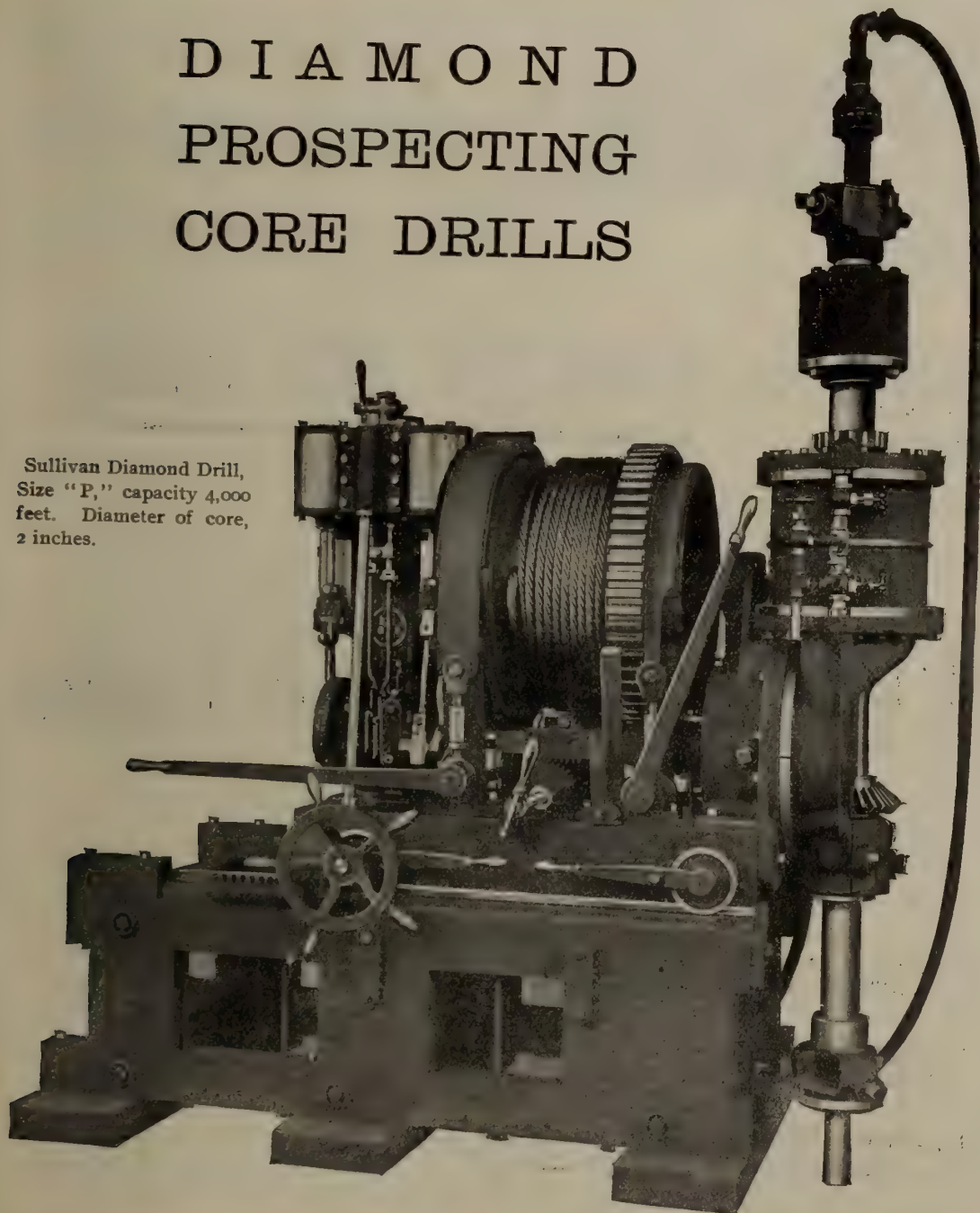


# SULLIVAN MACHINERY CO

## SULLIVAN & BULLOCK

### DIAMOND PROSPECTING CORE DRILLS

Sullivan Diamond Drill,  
Size "P," capacity 4,000  
feet. Diameter of core,  
2 inches.



Built in capacities  
from 300 to 6000 feet,  
and in nearly 20  
styles, for any condi-  
tions of service.

Operated by hand,  
horse-power, belt,  
steam, compressed air  
or electricity.

We also build  
Air Compressors  
Rock Drills  
Quarrying Machines  
Coal Mining Machines

CLAREMONT NH  
NEW YORK  
PITTSBURG

135 ADAMS ST.,  
CHICAGO. U.S.A.  
EUROPEAN AGENTS 25 RUE RAFFET PARIS

ST. LOUIS  
DENVER  
EL PASO



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.

### Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,  
 President.

CHARLES FERGIE,  
 Vice-Pres. & General Manager.

D. FORBES ANGUS,  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glance Bay, C.B. Canada

### **MINERS OF**

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

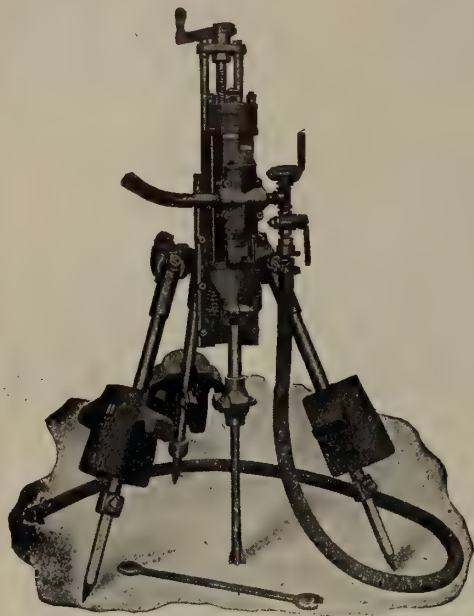
M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.



# JEFFREY Coal Cutting Hauling Drilling Screening Crushing Dredging Elevating Conveying Coal Washing Power Transmission MACHINERY



BEST ROCK DRILL IN THE  
MARKET

Catalogue No. 72

Elevating-Conveying  
Machinery

May we send you a copy?

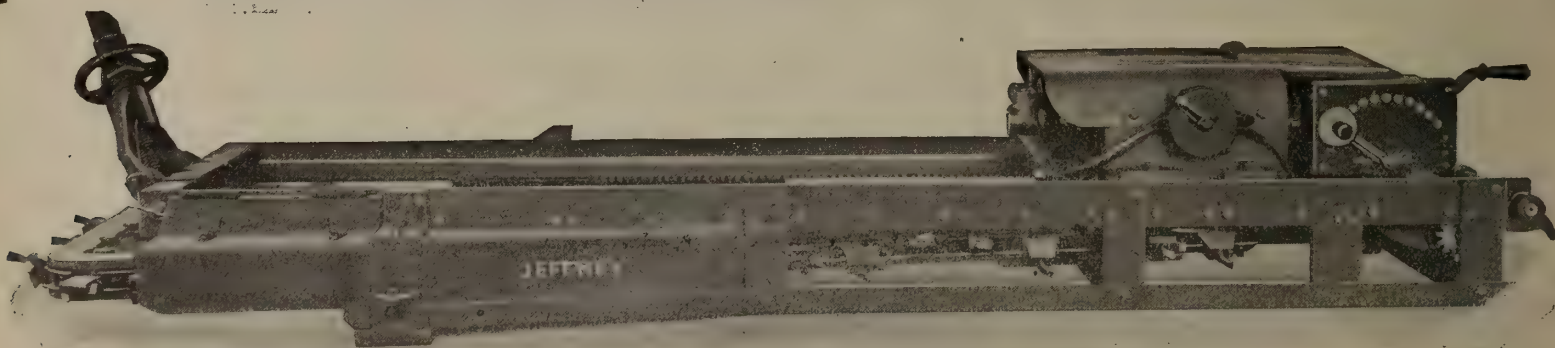
## COAL CUTTERS

### ELECTRIC MINE LOCOMOTIVES

Catalogue No. 19 describing  
these is yours for the asking



We can elevate or convey your  
material—bulk or package, wet  
or dry, up, down, straight along,  
sidewise, any size, any distance



JEFFREY 16A ELECTRIC CHAIN COAL CUTTER.

ADDRESS

## THE JEFFREY MFG. CO., Columbus, Ohio, U.S.A.

Montreal Representatives—WILLIAMS & WATSON

Toronto Representatives—A. R. WILLIAMS MACHINERY CO.



# FLORY HOISTING ENGINES STEAM AND ELECTRIC

Are designed for "STRENEOUS" duty. In Mines, Quarries, and the various requirements for Contractors: Pile Driving, Bridge Building and general Hoisting Purposes . . . . .

The FLORY CABLEWAY  
and TRAMWAY SYSTEM  
IS UNEQUALLED

Slate Mining and  
Working Machinery

SALES AGENTS—

I. MATHESON & CO.,  
New Glasgow, N.S.

W. H. C. MUSSEN & CO.,  
Montreal.

## S. Flory M'f'g. Co.

Office and Works: BANGOR, Pa., U.S.A.

ASK FOR OUR CATALOGUES.

If you wish to reach  
the best buyers of...

### Mining Machinery

In Canada

Advertise

in

the

## CANADIAN MINING REVIEW

THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

**MONTREAL, Que.**

# BOILERS

TANKS AND  
WROUGHT IRON  
WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# Electric Blasting Apparatus.

Adapted for Firing all kinds of Explosives used in Blasting.

## Victor Electric Platinum Fuses.

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

## Blasting Machines.

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

## Victor Blasting Machine.

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

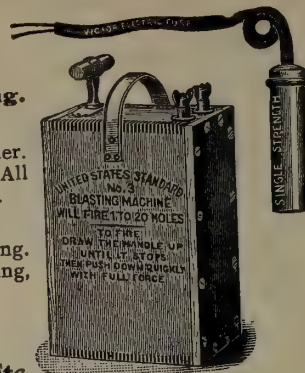
Insulated Wires and Tapes,

Blasting Caps, Fuse, Etc.

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**



MANUFACTURED ONLY BY



SEND FOR CATALOGUE

# Hamilton Powder Company

## Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

# DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

# ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

**ONTARIO POWDER CO. Limited**

115 BROCK STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings. . . .

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and Lachine Locks, P.Q.

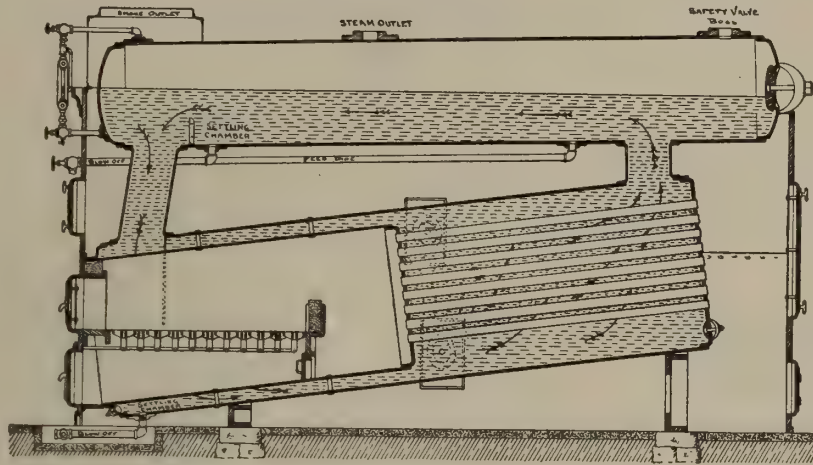
# MILL AND MINING MACHINERY

Shafting. Pulleys, Gearing, Hangers, Boilers, Engines, Steam Pumps, Chilled Car Wheels and Car Castings. Brass and Iron Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulean Iron Works. **OTTAWA**



## Combines the Best Qualities of Other Boilers.



The Mumford Standard internally fired boiler combines to a remarkable extent the best features of the Scotch and English types of internally fired boilers, together with the lighter weight, less floor space and more perfect circulation of the best boilers of the American water tube type.

The construction throughout, except the tube sheets, is cylindrical and spherical, requiring no stays; the boiler is supplied with an outer steel casing or for brick setting as desired by the customer.

The steam and water space is divided between two cylindrical shells; the thickness of plate is not so great as in the Scotch marine type, and the expensive and troublesome rear combustion chamber is avoided.

**Robb Engineering Co. Limited**  
Amherst, N.S.

**AGENTS :** WILLIAM MCKAY  
19 McKenzie Crescent, Toronto.

**WATSON JACK & COMPANY**  
7 St. Helen Street, Montreal.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

### British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

## Kingston, Ontario.

### THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN
 

GROUP I.

  - (a) Mining Engineering.
  - (b) Chemistry and Mineralogy.
  - (c) Mineralogy and Geology.
  - (d) Chemical Engineering.

GROUP II.

  - (e) Civil Engineering.
  - (f) Mechanical Engineering.
  - (g) Electrical Engineering.

GROUP III.

  - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
Sept. 30th, 1903.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# BRODERICK & BASCOM ROPE CO.

NEW  
B.B.B.  
MAKE



WORN  
B.B.B.  
MAKE

WE MANUFACTURE  
**WIRE ROPE**  
FOR ALL PURPOSES.



Special Arrangement for Curves at the Sherrard Mine.

Section  
of Our  
Patent  
Steel  
Rope.

Condition of  
Patent  
Steel Rope  
after  
Five Years  
Continuous  
Service.

805-807-809 North Main St., St. Louis, Mo.



LOBNITZ' GOLD DREDGERS ARE  
AT WORK IN BRITISH NORTH  
AND SOUTH AMERICA, AFRICA,  
ASIA, &c.

LOBNITZ & CO., LIMITED,  
MANUFACTURE DREDGE PLANT.  
MOST IMPROVED DESIGNS.  
**GOLD DREDGERS.**  
ALL PARTS MADE TO GAUGE  
QUICK DELIVERY OF STANDARD SIZES.  
ADDRESS LETTERS:  
LOBNITZ & CO., LTD., RENFREW, SCOTLAND.

Telegraphic Address:  
LOBNITZ, RENFREW A1 Code used.

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

# The New Jackson Hand Power Rock Drill

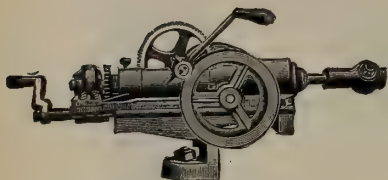
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

WILL WORK IN ANY POSITION, IN ANY ROCK.

It Saves Steel,

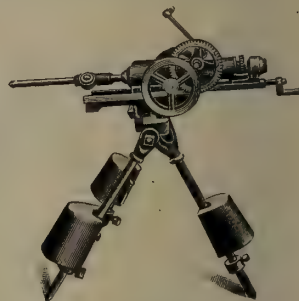
It Saves Labor,

It Saves Money.



Write for Catalogue.

JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.



## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.

This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.



## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

# STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



# PUMPING MACHINERY

FOR

## WATERWORKS and MINES

### OFFICIAL TRIAL

LEEDS WATERWORKS

Steam per Pump  
Horse Power per Hour

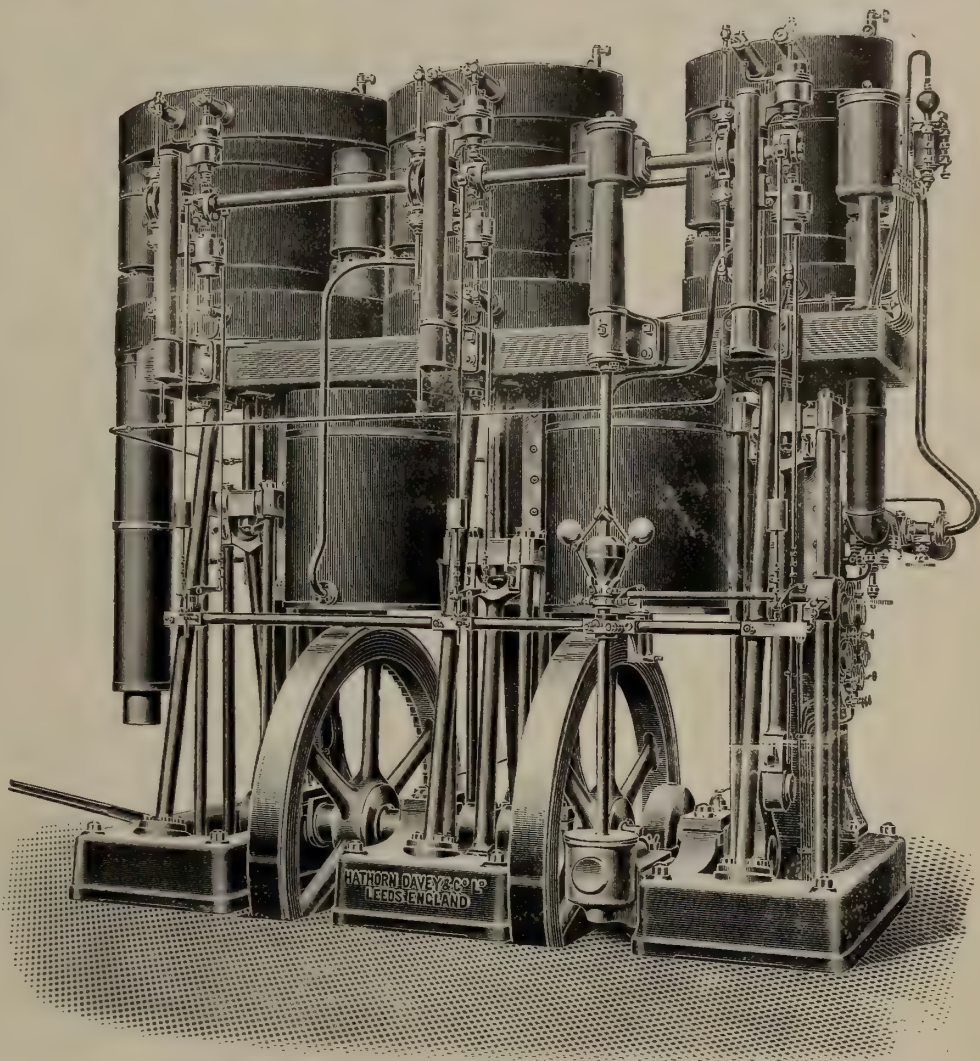
13.051 lbs.

Steam per Indicated  
Horse Power per Hour

11.91 lbs.

Mechanical  
Efficiency

91 per cent.



**HATHORN DAVEY & Co. Ltd.** LEEDS ENGLAND  
Sole Canadian Representatives **PEACOCK BROTHERS** Canada Life Building MONTREAL

## The Canadian Mining Manual

This standard work of reference to Canadian Mining undertakings and active industries is NOW READY. A complete mining directory. New features. Arranged alphabetically, classified by industries and by Provinces

For the  
MINE MANAGER,  
THE CAPITALIST and  
THE MANUFACTURER.

Bound in Cloth.

Price Four Dollars.

THIRTEENTH  
YEAR

1903

THIRTEENTH  
YEAR

BY

**B. T. A. BELL**

EDITOR CANADIAN MINING REVIEW  
SECRETARY CANADIAN MINING INSTITUTE.

Published by **THE CANADIAN MINING REVIEW** OTTAWA, Canada



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
**Metals, Mattes, Etc.**  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE

DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

**Canadian Mining Manual and  
Mining Companies Year Book**

1903

## NICKEL

The  
**Canadian Copper  
Company**

43 EXCHANGE PLACE  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

43 EXCHANGE PLACE  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reserva-  
tions covering nearly a quarter of a million acres in  
Eastern Ontario, and principally within the belts con-  
taining Iron, Phosphate, Gold, Galena, Plumbago,  
Mica, Marble, Building Stone, and other valuable  
minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and  
Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

GEO. G. BLACKWELL, SONS & CO. LTD.  
THE ALBANY, LIVERPOOL, ENG.

## LEDoux & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building

16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### PARMALEE & WELD

Successors to Pohle & Parmelee

ANALYTICAL CHEMISTS and ASSAYERS.

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical processes or patents.  
General Commercial analysis.  
Prices and sample sacks free on application.

P.O. Box 1421. 1755 Arapahoe St. Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to

538<sup>1</sup>/<sub>2</sub> Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

**BULLION, BRITISH COLUMBIA.**28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON . . . . YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc. (McGill)**

CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street MONTREAL

**ASSAYS OF ORES.**CHEMICAL AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

**RAT PORTAGE . . . . ONTARIO.**

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.8-KING STREET-8  
MANCHESTER, ENGLAND.**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON . . . . B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE . . . . ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

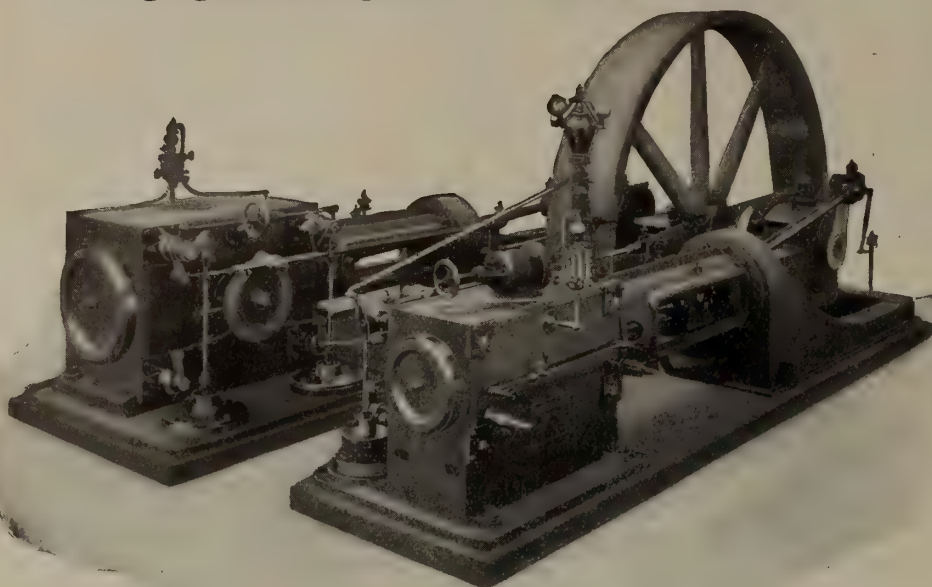
GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

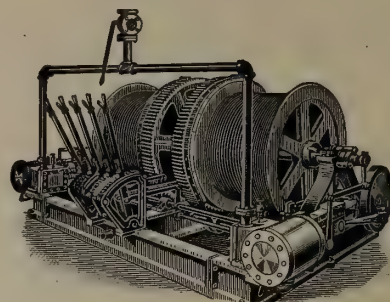
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS,

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels  
for Dredging, Dykeing, Ditching, GOLD  
MINING, Etc., of various Styles and  
Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES,  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.



# WIRE ROPE

All kinds and sizes, and for all purposes.

PRICES RIGHT.

PROMPT SHIPMENTS.

Standard and Lang's Patent Lay.

## The B. Greening Wire Co. Limited

HAMILTON, ONT.

MONTREAL, QUE.

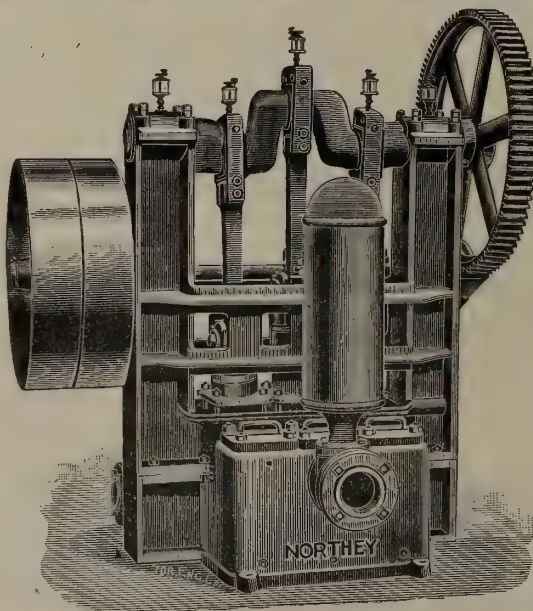
## Pumps for Mine Work

Triplex Power Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.

**THE NORTHEY CO.,**



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN  
THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 11.

NOVEMBER, 1903.

VOL. XXII., No. 11.

## Metalliferous Mining in British Columbia.

There is no more interesting and important feature than the application of the Elmore Oil Process to the concentration of the ores of the Rossland Camp. As this process has been fully described it is not necessary to go into details as to the method. We are content with chronicling the important fact that it has solved the problem of recovering from the waste dumps of 90 per cent. of the values in gold and silver. The result has already justified the establishment of a plant by the War Eagle and Centre Star companies and now the Le Roi No. 2 Co. is installing one. The development of this process has been in the natural line of the evolution of economical ideas in a low grade camp. In the early days attention was devoted entirely to extracting small tonnages of high grade ore and consequently returns running as high as \$25.00 per ton were made. Upon these returns properties were sold for fabulous prices but the purchasers discovered that as soon as they began to increase the tonnage the values rapidly diminished and it may be taken for granted to-day that the statement made in our columns in 1897, that the Rossland Camp was an eight to ten-dollar camp has been amply verified. This, however, now that the dumps can be treated and got to yield from two to three dollars a ton will justify the development of mining to an extent hitherto unknown. The increase in tonnage will find employment for many miners and will support a larger community and already there are not wanting evidences of greatly increased activity and of development undreamt of a year or two ago. Rossland has passed through trying times, but has held its own better than most western camps and will yet justify the opinion of those who have all along believed in its permanency.

One would fain hope that the recent tour of the English members of the Associate Chambers of Commerce in British Columbia would have the effect of attracting English capital for the development of the mineral resources, which at the present are being exploited by American capitalists. It is true that English investors have been singularly unfortunate in their Canadian speculations but this has been due to the irrational methods of the English companies as much as to the unscrupulousness of Canadian and American mine owners. The ill-luck attending English mining investments is not entirely chargeable to Canadians. If there has been misrepresentation and exaggeration on one part there has been ignorance and pigheadedness on the other. In few instances have really competent men been sent out to examine properties, and important deals have been closed by greenhorns who knew little more about metal-mining than cheese-making, but whose

report was relied upon because forsooth they were English. We have always contended that the best experts only should be sent out and if this were done they would be able to hold their own against sharks, whether American or Canadian. In many instances where really competent men have been sent out they have not been sent in the first instance but only when it was too late to correct the mistakes of their predecessors. We are driven to these remarks because Americans are still snapping up all the best mining propositions in the west. They will not retain them for permanent operation, this is not the American method. Their method is to obtain and then after spending a small amount re-sell them to English companies at a high figure. This has been the history of nearly every mining enterprise in B.C. The development of the coal and coke industries during the last year has been enormous. The opening up of an entirely new district in Alberta, which in the near future will produce a million tons of coal per annum has been done without the employment of one dollar of English money, a most regrettable fact. We are on the eve of the establishment of steel making in this country and the benefits of this new and vastly important industry will go to our American neighbours. Among the visitors to the west recently were some of the most prominent iron, steel, and coal magnates of the old country, and these could render no more greater service to the Empire than by interesting English capital in the development of the mineral resources of the Canadian West.

## Deep Gold Mining in Nova Scotia.

Gold mining in Nova Scotia began about the year 1860, and has not made much progress since that date. The annual output has varied from 10,000 to 35,000 ounces.

The early operations were conducted with little skill, and some thirty years passed before the experience gained in other countries was applied to the provincial mines. At present several companies are working on business lines and getting good returns. Continual losses however show that many have not learned the principles of legitimate mining.

Owing to the abandonment of every mine, in the earlier days, as soon as the quartz fell below the pretty high figure required to yield profits, it soon became an undisputed dogma that all Nova Scotia gold was shallow. The gold being free milling no one tried to see if it still remained in the quartz and sulphides even if invisible. Mines were abandoned which today show no free gold but enough in the metals to pay the careful miner. It may safely be said that for a long period



in Nova Scotia no assays were ever made, and it became a maxim that all ore was valueless unless the miner could see the gold in the quartz.

This fallacy has now been pretty well exposed, and tailings and concentrates receive considerable attention. Still the lakes, rivers, and swamps have received thousands of tons of tailings which represented in many cases handsome margins of profit.

The other axiom, the persistence of gold to shallow depths only, is dying hard. For years the capitalist invited to invest in our gold mines invariably objected, "Your mines carry gold only to limited depths," and there is no opening for investment. This criticism was true as far as experience had gone. The dome shape of the Nova Scotia gold fields became known at an early date, with its intercalated quartz bands radiating away from an anticlinal and sweeping round the dome of elevation. The veins were worked as they outcropped down as far as the gold held to depths up to 500 feet. It appeared from the structure probable that there might be veins underneath these not coming to the surface and binding over the anticlinal. It was some time before this was proved by working.

The discovery at Bendigo, Australia, that a shaft sunk on the line of the anticlinal axis would cut the crowns of such unexposed veins as they turned over the fold led to a comparison with the structure of the Nova Scotia veins. It may be said that the veins in Nova Scotia do turn over the anticlinal axis as in the Australian district, referred to but it may be questioned if the facts so far observed in Nova Scotia can be relied upon to permit of a prediction that the physical conditions of the strata here will reproduce equally large and rich vein crowns, or saddles, and legs.

Any dictum as to the finding of gold at any particular point along the vertical plane of an anticlinal axis must be based on the rules governing the deposition of the gold. As yet it may be said this important point has not been studied in Nova Scotia.

It may be stated that the gold in the Nova Scotia veins was deposited before the transverse foldings took place, and possibly to some extent later. There is presumably no proof that the gold came from ascending waters, as the lessening in thickness of the legs, with depth, would point to a line at which the strata were absolutely compact.

Inferentially the source of the gold is to be found in the rocks adjacent to the openings or loosened portions of the folds. These rocks originally receiving the fold as an alluvium would receive it with more or less irregularity. Hence caution as to any positive assurance of any shaft in any anticlinal axis giving access to succeeding rich quartz bands.

However the analogy with Australia is striking and the practical comparison seems to be fairly borne out.

For a number of years the Government of Nova Scotia has been importuned to sink a deep shaft and settle for ever the question of the existence of gold at depths in this province. The only practical outcome seemed to be a premium to the miner who found gold in depth, but it was difficult to see how any miner could do his share without some guide as to location, etc.

Mr. Faribault, the geologist of the Canadian Geological Survey, having made for years a close study of the Nova Scotia gold fields, satisfied himself that the conditions here closely paralleled those of Bendigo, and that the life of the industry warranted the test of the pick. His advocacy of this view inspired the bolder miners of the province and they seem to have so far proved the correctness of his reasoning. The Government were now encouraged to believe that they saw a reasonable ground for action. The development of the coal fields of Nova Scotia had been materially quickened by the boldness of Premier Fielding. The gold fields if they could be proved

to be capable of systematic development, offered, owing to their great extent, a source of revenue greatly exceeding that derivable from coal, and the Government appear willing to venture again. In order that the public interested in this subject might be informed they procured from Mr. Faribault a report embodying the conclusions he has arrived at.

This report, which might have been in greater detail, gives important suggestions. Mr. Faribault urges that aid should be given to vertical shafts sunk close to the anticlinal axes so that the apices of veins in the richer zones should be intersected, and their legs be tested by cross cuts. As far as mining developments have been carried his advice is good.

The Government recently passed legislation pledging itself to subsidize the sinking of shafts, already 500 feet deep, provided they are properly located, if the owners are ready to go to greater depths.

In these notes no reference has been made to fissure veins. There are a number of these in the province, some of which have yielded good returns. Mr. Faribault contends from the standpoint of his theory of the intercalated veins that the permanency in depth of the gold contents of the fissure veins is a matter already so well thrashed out in other countries that no special government attention is needed as far as they are concerned.

This point of view is, again, connected with the source of the gold, but every one acquainted with the gold fields of the province will agree that the interests involved in the development of the intercalated veins as to number etc., is greater than in the case of the comparatively limited number of fissure veins hitherto opened. Under the head of the fissure veins may be classed the hitherto little known auriferous veins and deposits of several other old geological horizons of the province.

The public interested in gold mining will view with pleasure Mr. Faribault's labors in Nova Scotia and his deductions, and the boldness of the Government in grappling with a question of so much interest from a geological as well as a mining and revenue point of view.

#### Canadian Portland Cement Companies.—The Present Position of the Industry and its Future as an Investment.

While the columns of the "Official Gazettes" of the provinces are giving frequent notice of the incorporation of various companies organized for the manufacture and sale of Portland cement, and the country is covered by specious and glib-tongued agents, busily engaged in the sale of the stocks and shares of some already chartered, it is perhaps timely to draw attention to a few points concerning this important industry, which may not be in the possession of a considerable portion of the general public. When one considers the fact that most of the shares now being exploited are disposed of to persons unaccustomed to the methods of modern finance as interpreted and administered by the genial company promoter, the necessity seems to arise that such persons should be instructed in the idea, that perhaps there might be a *possible* chance for them to lose their money. Does it not seem strange that enterprises which their prospectuses endow with a dividend earning capacity of ten, twenty and even forty per cent., should have to peddle their shares around the small towns and villages of the country, in blocks of from a hundred, to one or two thousand dollars, when, if the success of the ventures was so transparently certain, our shrewd capitalists and business men would leave little, if any, of the stock to be taken up by the clergymen, lawyers, doctors, elderly maidens and widows, who are now being induced to subscribe such a large bulk of the shares. While it is not our desire



to in any way injure or retard the progress of any bona fide industrial enterprise, there is a duty we owe to a public, already severely scorched in illegitimate mining schemes; in obedience to which we will endeavour to state as clearly as possible the conditions which are to-day governing the production and sale of Portland cement in the Dominion. Having given the main facts as taken from the most trustworthy sources available, we can then leave the issue with our readers, satisfied that we have done what we could in the endeavour to put our information in such a shape as to be readily understood and digested by anyone possessed of a normal degree of intelligence.

Previous to 1897 no statistics of the Canadian production are readily accessible, as up to that year the figures given by the Geological Survey Department (which alone collected this data) included both natural and Portland cement. In 1897, however, the output of the latter material reached 119,763 barrels valued at \$209,380, or an average value of \$1.75 per barrel. During the ensuing four years the production shows a gradual and steady increase, as in 1901 the figures quoted by the Survey give the output as 317,066 barrels valued at \$565,615, or nearly three times the production of 1897. About this time it seems to have dawned upon some enterprising individuals that with such a remarkable expansion in the business, in a few years, *there must be money in it*. Whether this surmise proved correct or otherwise we have no means of ascertaining, but the fact, nevertheless, remains that, in the following year (1902) the production had increased to 594,594 barrels of a value of \$1,028,618, an increase in five years amounting to almost exactly *five hundred per cent*.

During the year ending June 30th last (1903) the Canadian imports of Portland cement as given by the Department of Customs in the Trade and Navigation returns, amounted 2,316,853 cwt., valued at \$868,131, divided as follows:—

|                         |                |           |
|-------------------------|----------------|-----------|
| From Great Britain..... | 516,796 cwt.   | \$187,572 |
| " United States.....    | 610,445        | 305,775   |
| " Belgium.....          | 814,252        | 244,633   |
| " Other countries.....  | 375,360        | 130,151   |
| Total.....              | 2,316,853 cwt. | \$868,131 |

This would amount, taking the weight of a barrel of foreign cement as 400 pounds, to an importation of 579,213 barrels of an average value of \$1.50 per barrel, to this cost must be added a duty of 12½ cents per hundred pounds amounting, at the average weight taken to 50 cents a barrel. Now add to these importations the amount of the Canadian production and we have the following:—

|                                  | Bbls.     | Value.      |
|----------------------------------|-----------|-------------|
| Imports of foreign cement.....   | 579,213   | \$1,157,737 |
| Production of Canadian cement... | 594,594   | 1,028,618   |
| Total.....                       | 1,173,807 | \$2,186,355 |

Assuming these figures to be fairly correct we find that roughly speaking, Canada's consumption of both foreign and domestic Portland cement amounted at the latest available date to less than twelve hundred thousand (1,200,000) barrels.

The next point to consider is, how long can we hope for such a phenomenal increase in the use of Portland cement to continue? We must not lose sight of the fact that during the past five years at least, Canada like the United States has enjoyed a period of prosperity and expansion unexampled in her history. But signs are not wanting in the business outlook, which indicate beyond question that this era of abnormal commercial activity is on the wane and that the time is fast approaching when operations of every kind will need to be conducted on the very closest margins in order that the period of depression may be passed in safety.

Are the manufacturers of cement both present and prospective, basing their calculations for future production on the figures reached in the past? The arrangements under way for the flotation of new

companies and increasing the capacity of several now in operation would lead one to conclude that such is their idea.

Now the only safe basis upon which it is possible to figure, when dealing with commodities other than foodstuffs is undoubtedly the demand for the same. In hard times as well as in times of plenty, poor humanity must be fed and if some of us unfortunately have not the wherewithal to purchase the necessities of life, these necessities must be supplied by the community at large, or the benevolence of individual citizens more independently situated. In any event no one ever heard of much food being given away on account of over-production, but the same rule does not apply regarding cement. In Germany a kingdom which has for many years past annually produced the greatest amount of cement manufactured by any one country in the world, the output in 1902 amounted to 29,000,000 barrels, while the home consumption in the same year was but 14,600,000 barrels, or in round numbers just *one-half* of the production. As the population of Germany is about 56,000,000 this would mean a *per capita* consumption of one-quarter of a barrel per annum.

Persons at all familiar with the conditions which have for a long time existed in the land of the Kaiser, as well as in other and older civilizations in the populous centres of Europe, will readily accept the fact that it will be *many years* before a country like Canada, whose population is scattered over a territory larger than that occupied by all the Great Powers, will be in a position to consume any such *per capita* amount of the material in question.

In the United States the production last year as given in the "Mineral Industry" is placed at 16,535,000 barrels, while the imports amounted to 1,945,490; deducting the amount exported, which was 340,821, this leaves the whole consumption of nearly 80,000,000 of people as 18,139,669 barrels or *less than a quarter of a barrel* per head of population.

Admitting for the sake of illustration that the *per capita* consumption of Canada at the present time is equal to that used in Germany and the United States, our annual production on the basis of a population of 6,000,000 should *not be more than* 1,500,000 barrels as our *exports are practically nil*. If then the extreme limit of consumption is placed at one barrel to every four persons in the country and that we should need another million of people to consume even 250,000 barrels more, what are we going to do with the production of the near future as foreshadowed by all these new companies entering the field and apparently entirely ignoring the economic needs of the community. At the present time the following companies are, according to a western Ontario exchange, steadily producing at the rate of 725,000 barrels per annum, and can easily increase their output to well over a million and a half: The Owen Sound Co., Canadian Portland Cement Co., The Lakefield Co., The Imperial Co., The Hanover Co., The Grey and Bruce Co., The Crescent Co., The Sun Co., and the National Portland Cement Co.

In addition to these actual producers we have the following works now under construction:—

|                                        | Projected Capacity |
|----------------------------------------|--------------------|
| The Raven Lake Portland Cement Co..... | 600 bbls. per day  |
| The Ontario " " " " " " " " " "        | 1000 " " "         |
| The Belleville " " " " " " " " " "     | 2000 " " "         |
| The International " " " " " " " " " "  | 1000* " " "        |
| The Colonial " " " " " " " " " "       | 1000 " " "         |

Making a total daily capacity of 5600 bbls. or at the rate of 1,680,000 per annum taking the year as 300 working days.

If this were all there might still be a chance by strict economy and careful management to keep the production down to such a figure as would enable the various companies with plants now in operation or under construction, to make a fairly decent financial shewing, but alas,

\*Projected capacity now given as 1,800 barrels per day.



even this small shred of hope seems about to be taken from them as still another lot of prospective cement makers is looming up, in those lately granted charters by the provincial governments of Ontario, Quebec and Manitoba, viz:—

|                                | Projected Capacity |
|--------------------------------|--------------------|
| The Standard Co., Ontario..... | 500 bbls. per day  |
| The Superior Co., " .....      | 600 " "            |
| The St. Mary's Co., " .....    | 800 " "            |
| The Manitoulin Co., " .....    | 1,000 " "          |
| The Royal Co., Quebec.....     | 800 " "            |
| The Western Co., Manitoba..... | 1,000 " "          |
| The Manitoba Co., " .....      | 1,000 " "          |
| Total.....                     | 5,700 " "          |

or an annual output of 1,710,000 barrels. Should all these companies be in operation by 1905 the capacity of the cement kilns in the Dominion would be equal to a yearly production of 4,890,000 barrels or *more than three times the possible consumption.*

We might add that there may perhaps be *a few more* cement propositions which have been overlooked when going through our list of incorporations.

## EN PASSANT.

There is this consolation at any rate; in the Alaska shuffle we drew the two islands with the best and most pronounceable names.

We regret very much to learn that, according to a cable despatch from Lord Strathcona to the Militia Department, Major R. G. E. Leckie of the British force in Somaliland has been dangerously wounded by a leopard. Major Leckie formerly held a commission in the Canadian militia, and is a son of the well-known mining engineer, Major R. Gilmour Leckie, now of Sudbury, Ont. We extend our sympathy to the latter, and hope his gallant son may speedily recover from this mishap.

New Zealand has long enjoyed the reputation of being the most advanced of the British colonies in paternal legislation and government ownership of industries. So far has the management of business by the state gone in that country that is said one man out of every half dozen is in Government employment of some kind, or in receipt of a pension from the Government. What a paradise for politicians on the right side, with gifts in their pockets for one-sixth of the voters!

The Cataract Power, Light and Traction Company of Hamilton have let a contract to substitute aluminium for copper wire on their transmission line from De Cew Falls, Ont., to Hamilton a distance of about 35 miles. It is expected that twice the quantity of power can be transmitted over the new as compared with the old line. The copper wires are to remain in place until the current can be turned on over the aluminium line, consequently there will be no interruption to the service.

On October 19th the price of bar silver in New York reached 61¾ cents an ounce, the highest point touched for several years. Although this high figure has not been entirely maintained it still seems fairly steady above the sixty cent mark. The slight falling off is in a large measure due to the announcement by the United States Government that it would cease to buy on account of the Philippine coinage. The reselling by many of the Oriental banks was also largely a factor in the lowering of prices. Messrs. Pixley and Abel's circular gives the following as the shipments from London to the East from January 1st to October 15th, 1903:—

|               | 1902.      | 1903.      | Changes.    |
|---------------|------------|------------|-------------|
| India .....   | £4,799,170 | £4,778,975 | D. £20,195  |
| China .....   | 158,200    | 302,123    | I. 143,923  |
| Straits ..... | 390,820    | 721,879    | I. 331,059  |
| Total.....    | £5,348,190 | £5,802,977 | I. £454,787 |

The only occasion during the last three years upon which a higher price was quoted than that mentioned above was during January, 1901, in which month the average price was 62.82 cents per ounce Troy.

What influences are now at work to cause this marked advance in the face of the U. S. Government's adverse action *re* the Philippine coinage is of course hard to determine, especially when taken in conjunction with the recent decision of the Government of the Straits Settlements that no more silver dollars would be imported into that colony, due to the fact that in Singapore the quantity of silver dollars was entirely out of proportion to the currency requirements of the country. The fact remains, however, that prices still hold at a high level and there would seem to be every probability of the advance being maintained, as the opinion is freely expressed that the stoppage of silver purchases for the Philippines is merely a temporary measure and that the Indian mint will also resume buying at an early date owing to the relatively small silver balance in the hands of the currency department. Should the present level be maintained it cannot but be of immense advantage to the British Columbia mines, and taken in connection with the lead bounties recently granted by the Dominion Government, mining in that province should enjoy a revival of prosperity such as it has not experienced in many years.

The \$600,000 stock in the Canadian Westinghouse Company, which Ahearn & Soper, Limited, of Ottawa, undertook to place in Canada, was disposed of by the 15th inst. A very large amount of the shares have been subscribed for in the Capital where the greatest confidence is felt in the future of the Company. This confidence is due in a large measure to the high standing of the Canadian directorate, which is mainly composed of our most successful capitalists and men intimately acquainted with the practical side of all branches of electrical industry.

Messrs. Aron Hirsch & Son, through their New York representative, Mr. L. Vogelstein, of 90-96 Wall Street, kindly send us the following figures showing the German consumption of foreign copper for the months of January and September, 1903, compared with the same period of 1902-1901:—

|                   | 1903.        | 1902.       | 1901.        |
|-------------------|--------------|-------------|--------------|
| Import .....      | 63,527 tons. | 62,091 tons | 48,755 tons. |
| Export .....      | 7,797 "      | 6,718 "     | 7,233 "      |
| Consumption ..... | 55,730 "     | 55,373 "    | 41,522 "     |

The production of anthracite coal during 1903, which is already many millions of tons in excess of that for a similar period in 1902, is shown in the figures given below. Up to November 1st the tonnage mined and sold amounted to the enormous figure of 51,286,293 tons, or nearly 30,000,000 tons more than at the corresponding date last year. This is by far the greatest production ever reached in the history of the trade. With such an enormous output, persons unacquainted with present conditions would naturally expect that lower prices would rule during the coming winter, but such is not the case. The long continued strike which was terminated last fall, exhausted the large reserves usually held in the various cellars, yards and depots to such an extent that on the 1st of May of the current year they were practically nil—instead of amounting as usual to more than ten millions tons. The increased production will therefore be largely used in restoring stocks on hand to their former condition. Another



reason for maintaining prices at their present level is the fact that owing to the fixing by the Gray Commission, of the minimum wages scale, for the next two years, the cost of production will not be lessened in the meantime. The following are the figures of production for the first ten months of 1903 compared with the same months last year:—

|                 | Tons 1903. | Tons 1902. |
|-----------------|------------|------------|
| January .....   | 5,964,950  | 4,538 138  |
| February .....  | 5,070,608  | 3,741 253  |
| March .....     | 5,211,450  | 3,818,767  |
| April .....     | 5,044,998  | 4,924,830  |
| May .....       | 5,156,449  | 1,708,892  |
| June .....      | 5,436,497  | 92,203     |
| July .....      | 5,377,495  | 250,079    |
| August .....    | 5,169,402  | 300,774    |
| September ..... | 4,654,444  | 445,883    |
| October .....   | 4,200,000  | 1,276,257  |
| Totals .....    | 51,286,293 | 21,097,076 |

Speaking editorially of the work done in the Atlin mining district during the season of 1903, the *Atlin Claim* has the following:—

The mining season, just closed, in Atlin, has been marked by many changes, more particularly as regards methods of mining. The passing of placer claims from individual miners to companies has likewise been a feature of the past season. A very large amount of outside capital has found its way into the district while many of the pioneer miners are taking themselves off to other fields. We regret to see many of these good men, who have done so much to bring the camp to its present state of importance, leave us now, but in leaving Atlin they will do for other districts what they have done for this.

As the years go on and the shallow diggings become exhausted, it becomes apparent that, with a few exceptions, the deep ground of the district can most profitably be worked by hydraulic or mechanical methods, both of which are beyond the reach of the average miner, and as a matter of course, the day of company operations is even now at hand. In the progress of events we must bury sentiment and welcome the new order of things, as being the best for the development of the district.

Though much of the older part of the camp has passed or is passing into the hands of capitalists, there is yet much ground available and open for the prospector and miner in the contiguous country to the east and south. This territory has hitherto received but an occasional passing glance from hunters or from men en route to Teslin or the Liard country. Developments during the past season have shown that the Dixie valley is worthy the close scrutiny of miners, and it is a well known geological fact that the gold area is by no means confined to the Pine and McKee watersheds. As we have already said, the land is open, why, then, should our pioneers leave Atlin for other districts?

The American Iron and Steel Association has collected statistics showing the growth of the Canadian production of iron and steel within recent years. Beginning with 1895, the Association's figures show the following production:—

|            | Pig Iron | Steel Ingots | Rolled Iron and Steel |
|------------|----------|--------------|-----------------------|
| 1895 ..... | 37,829   | 17,000       | 66,402                |
| 1896 ..... | 60,030   | 16,000       | 75,043                |
| 1897 ..... | 53,796   | 18,400       | 77,021                |
| 1898 ..... | 68,755   | 21,540       | 90,303                |
| 1899 ..... | 94,077   | 22,000       | 110,642               |
| 1900 ..... | 86,000   | 23,577       | 100,690               |
| 1901 ..... | 244,976  | 26,084       | 112,007               |
| 1902 ..... | 319,557  | 182,037      | 161,485               |

For the present year a definite bounty of \$6 per ton on wire rods, \$3 per ton on structural shapes, \$3 per ton on plates and \$3 per ton on pig iron has stimulated production. The output is expected to greatly exceed that of last year.

In charging the grand jury recently in the celebrated Whittaker-Wright case, the Recorder of London said:—

"I cannot refrain, and I do not see that I ought to refrain, as Recorder of London, a city which is the very heart of the Empire, from making this observation. Whatever may be the result of this prosecution to the person most directly interested, I earnestly hope that the facts disclosed in the papers now lying before you will serve as a solemn warning to persons in high positions, and make them consider long before they lend their names to commercial enterprises with the working of which they have no practical acquaintance, which, however honest they themselves may be, thus renders them an easy prey to wicked and designing men. It is no wonder that the public are deceived and misled as to the solvency and respectability of joint-stock enterprises, when a prospectus almost invariably contains the names of persons of high position who have often, in other capacities, rendered distinguished services to the State, but, alas! are not sufficiently mindful of the sacred obligations which attach to their position."

Speaking editorially as to the suspension of the Consolidated Lake Superior Company and the closing down of the Company's works, the *Victoria Colonist* has the following:—

The Clergue industries at the "Soo," about which so much have been heard of recent years, have passed into the hands of a receiver chosen by Speyer and Company as mortgagees. The receiver is presumably expected to keep things running and thus preserve the business good will from being impaired. In the meantime Senator Dandurand and Mr. Clergue will make strenuous efforts to interest capitalists in the acquisition of the property. Naturally they turn to Great Britain for assistance of this kind. Such enterprises cannot be run on wind, nor will they stand financing on the lines adopted in the notorious Shipping Combine bubble. Hard cash, and lots of it, is necessary, and in no part of the world can it be looked for to better advantage for Canada than in Great Britain. It would be a source of gratification to know that the Clergue industries will be owned and operated by British capital.

Whilst it is true that the lead mining industry is somewhat improved during the last few months, its present conditions cannot be considered satisfactory and in view of the strong representations made to the Government at Ottawa by a deputation from B.C., who were trying to obtain Government aid, it is regrettable that more definite information has not been afforded as to the reasons why, since the decision to grant a bonus of five hundred thousand dollars, the results have not been more pronounced. Having instituted careful enquiries we are able to say that the present position can be explained upon satisfactory grounds which do not for one moment admit of doubt either as to the ultimate revival of the industry or the immense benefit of the bonus.

While it is nearly three months since Mr. Fielding made the promise, it was only a few weeks ago that the Government officially ratified the grant and the various lead mining companies were either unable or unwilling to proceed with the heavy expenditure necessary to re-open the mines until the payment of the bonus was an assured fact. This made it too late in the season to do very much as in the Sandon District snow fell in the middle of October, meanwhile however with the single exception of the St. Eugene Mine, at Moyie there has been an all round increase in the staff and every effort put forward to secure large out-puts. Only those on the spot know the adverse conditions which have to be contended with in deporting the products of the British Columbia lead mines. Many of the mines are of great



elevation and quite inaccessible to mechanical traction. These depend upon raw-hiding which cannot be commenced until there is a heavy fall of snow and considerable frost. Allowance must also be made for the fact that in consequence of the long continued depression in this industry many of the men have become scattered and the majority have returned to the Western States, principally Idaho and Washington. It takes a long time to secure the return of these men, and to get the necessary supplies. We are satisfied that the present aspect of things as it appears to the on-looker is not a true index of the effect of the bonus or of the extent to which it has already stimulated activity in the lead mines of B.C. The work which counts does not show at the present stage, it is being vigorously carried on and will bear fruit next season in the undoubted revival of this important industry. Whether ultimately the bonus will have as wide a spread and permanent an effect as the tariff legislation asked for remains to be seen; but if the result is that the Government aid attains what it aimed at then the logical sequence is to make that aid permanent by incorporating it with the tariff.

### Canadian Chromite.\*

By JOSEPH HYDE PRATT.

The principal chromite deposits of Canada are in the vicinity of Black Lake and Coleraine, Quebec Province. The mineral occurs in the peridotite rocks or serpentine, an altered facies of this. In this district these rocks form a series of approximately parallel belts of varying width, which can be traced in a general northeast-southwest direction for a distance of over 20 miles. These rocks are not continuous throughout this distance, but are intercepted by masses and narrow dikes of granitic rock, and seams and small masses of this granitic rock were observed that were entirely surrounded by the peridotite. This latter rock has in some instances been entirely converted to serpentine and has lost its own individuality, while in some places it has the structural appearance of the original peridotite. The chromite does not occur scattered throughout the mass of serpentine, but is in most cases concentrated in pockets and seams of varying dimensions, near the contact of the serpentine with the granite. The sizes of the original masses of peridotite have determined to some extent the relation of the chromite to the contact. This is in accord with the theory advanced for the origin of the chromite found in these basic magnesian rocks, which is, that it was held in solution in the molten magma when it was intruded into the country rock and was among the first minerals to separate out as this magma began to cool. This separation would take place usually near the outer boundary of the intruding masses of peridotite, for here it would cool first; but where the magma had included within itself masses of granitic rock, these would exert a cooking influence and tend to cause a separation of chromite adjacent to them. Then, again, with the narrower masses of peridotite, the mass would quickly lose some of its fluidity, and there would be less chance for the chromite to be concentrated together and to separate out in large masses. Thus, as would be expected, the chromite does not occur in well-defined veins, but in pockets of varying dimensions, which in some cases are connected with one another by small seams of chromite and in others are entirely separated from one another. It is also found more or less intimately mixed with the serpentine, and often there is a gradual transition from the nearly pure mass of chromite through the mixture of chromite and serpentine to the pure serpentine. The larger masses of chromite ore are associated with the larger masses of serpentine, and the mixtures of ser-

pentine and chromite are found with the smaller areas of serpentine and with those which have the included masses of granite.

There has been considerable work done in this Black Lake district in the development of the chromite deposits. The mineral was observed in some instances lying directly between the serpentine and the granitic rock, making a sharp contact with each, as is well illustrated at the Caribou chromite pit. In other cases the chromite was separated from the granitic rock by a narrow seam of serpentine, and in still others the ore consisted of an intimate mixture of chromite and serpentine. Where the ore occurs in masses it is usually of sufficient purity to ship directly, as mined, without any further treatment. Where it is an intimate mixture of the serpentine and chromite the ore has to be crushed, rolled, or stamped, and then passed over Whifley tables or other concentrators. The method now being used at a number of mines is first to crush the ore, then to pass it through a stamp mill and over Whifley concentrating tables. The concentrates are then dried and bagged, and are ready for shipment. At the Whitney mine the company has recently increased its plant from a 5 to a 10 stamp mill. The concentrates carry a high percentage of chromic oxide, as does also the pure masses of chromite that have been shipped directly as mined. Since these chromite fields were opened there have been shipped about 12,000 to 15,000 tons of chromite. A large part of this has been mined by means of open cuts and pits, the largest one being the chrome pit No. 1 of the Coleraine mine, which is 50 feet deep and 60 feet long. Some of the mining has been done by means of shafts and tunnels, and in some respects this is by far the more satisfactory method. At the Caribou mine the deepest shaft is down 105 feet.

During 1902, mining was carried on at the Whitney and Coleraine mines and at the mine of the Montreal Chrome Company. The production amounted to 900 short tons, valued at \$13,000. This will undoubtedly be increased in 1903, as the Coleraine mines are being extensively and systematically worked.

### Rope Tramways.\*

By S. DE ZOMBORIA.

There is a tendency to-day to render the aerial tramway more and more automatic in its operation. It is a question in the mind of the trained engineer: Just what is the limit? What is of more concern to the prospective or actual owner of a tramway? How far can we go in making the tram entirely independent of human control and then take the risk of eventualities which are connected with all such machinery? Reduction of labour costs is always an object in considering operating costs, but it is, in the opinions of many engineers, not advisable to attempt to dispense entirely with it. The aim of the constructing engineer should be to plan a tramway which will be as nearly automatic as is consistent with due regard for the safe conveyance of its traffic.

In all the double-rope systems which are in general use, the principle of construction is the same. That is, the ropes, pulleys, and sheaves, as well as the other machinery in use, perform their duties in the same general fashion, differing only in design. The difference between the systems is chiefly in the manner of attaching buckets to the rope. Therefore, double-rope tramways might be divided into three general types:—First. That system in which a clip or lug nut is permanently attached to the running rope, which drags the bucket suspended on a standing or immovable rope. Second. That system in which a clutch attached to the bucket seizes the running rope and remains attached thereto by means of friction. This latter system might be further sub-

\* Extract from "Mineral Resources of the U. S.," Washington, 1903.

\*Abstract of a paper read before the American Mining Congress, at Deadwood, S.D. Sept., 1903.



divided into two classes:—One in which the friction is created by an eccentrically operating lever locked and released automatically, securing a constant friction that is independent of the angle which the traction rope forms with the horizontal; second, one in which the clutch exerts friction on the traction rope by a lever on which the weight of the bucket is transmitted. This friction varies with the cosine of the angle which the line forms with the horizontal. The third and latest development is that system in which the buckets are fastened permanently at certain distances to the traction rope. On this system the buckets are loaded with a walking-bin which runs simultaneously on parallel rails above the buckets in the station, loading the same.

Of these three systems of double-rope tramways, it can be said that the clip system enables us to handle the buckets at exactly the same intervals. This prevents accidents which might result from the failure of labourers to keep the buckets loaded and moving at the proper distances. One marked disadvantage of this type is the fact that the wear on the traction rope is constantly in the same place, thereby weakening the strength of the rope at these points. Shifting the clips from time to time is resorted to in an effort to overcome this difficulty, but it entails a loss of time. In the second class this difficulty is not encountered, because the grip seldom ever clutches the same spot on the traction rope at the same place twice in succession. Slight alterations, also, in the relative position of the buckets on the rope, work no disadvantage in the operation of this second type. To secure an even distribution of the buckets along the line, signals are easily arranged by which the workman is enabled to estimate the proper intervals. With the assistance of the eccentrically working friction grip arrangement, as well as with the clip, all grades can be overcome, because the friction on the traction rope is constant and uniform. In the type in which the weight of the bucket is transferred by means of a lever on the clutch, and is transformed to friction, the limitation of grades to be overcome is confined to those not in excess of 45 degrees. The third system, that in which the buckets are attached permanently to the traction rope, is probably the most promising one, as here the loading as well as the unloading of the buckets is automatic, with a corresponding saving in operating costs. The more or less complicated grips and clip-catchers are done away with. It requires buckets of less expensive construction and overcomes any grade that any other system of rope tramways can traverse. This last type of construction is of such recent development that comparatively few plants are in operation in this country. As far as is known it renders most successful service.

And now a word as to the costs of installation of rope tramways. Naturally, the single-rope tramway is the cheaper type of construction, but popular opinion is more favourable toward the double-rope tramway, as evidenced by the number of that type which have been and are being installed by mine managers. The heavier the traffic to be handled the heavier and more substantial parts must be used in the construction work. Many other considerations, based upon the peculiar conditions which attend the installation of tramways at different mines, must be considered in the individual case. Generally speaking, we are within limits when we say that, including all the machinery parts, the average per foot of line constructed may be regarded as ranging from 1.80 to 2 dollars per foot. These figures include the necessary cables, towers, sheaves, and buckets. To these figures must be added the construction costs, which vary according to freight rates, price of timber, labour, and delivery to the point of construction. Very naturally this affords a wide variation in costs, but as an example it might be cited that in Colorado the construction costs would probably be from 1 dollar to 1.15 per foot. Therefore it is safe to estimate the entire cost of a tramway per foot in any region where the conditions are approximately the same as in Colorado, at from 3 to 3.10 dollars per running foot.

### The Cyaniding of some Silver Ores by Percolation.\*

By ANDRÉ P. GRIFFITHS and FRANK W. OLDFIELD.

The treatment of gold ores by the cyanide process has, during the past ten years, been brought to a very high degree of excellence, and the literature of the subject is both varied and exhaustive. The same cannot be said, however, of the cyaniding of silver ores, of which practically nothing is known. The reference to this subject occasionally made in standard works, is generally vague and short, and no information of practical value can be obtained or has yet been published, at all events in so far as the percolation treatment is concerned.

The cyaniding of silver ores has, up to the present, been generally considered as presenting many difficulties, principally owing to the complex nature of the chemical reactions involved, of which many are still obscure; and the practical application of this process has been retarded by numerous failures and the extensive vogue of the pan-amalgamation process.

The latter process, however, is an expensive one, necessitating roasting, dry crushing, and the use of large amounts of salt, &c. In certain countries like Mexico, where there are large and numerous low grade silver lodes, and where fuel is scarce and expensive, and transport charges are heavy, the dry crushing and pan-amalgamation of silver ores cannot be made a profitable undertaking in all cases. It was with a view to reducing costs mainly, and increasing a restricted output, that the treatment of the low grade ores of the Palmarejo Mines was suggested and tried. Although the authors are not the initiators of this new departure, yet in their respective capacities of General Manager and Cyanide Manager of these mines, they have treated, since the beginning of operations, nearly 30,000 tons of ore, and have put the process to the test, and brought it to its present commercially successful basis. They are aware of the existence of several plants for the cyaniding of silver ores by agitation, but do not know of any successfully worked percolation plant.

It is in the hope that the results obtained by them may prove interesting, and of some value to the metallurgy of silver, that the authors have been induced to submit these notes to the members of the Institution.

*Description of the Ore and Plant.*—The ore which is treated belongs to the class of so-called "Sulphide" ores. The silver occurs mostly in the form of Argentite ( $\text{Ag}_2\text{S}$ ), with small quantities of Stephanite, the sulphide of antimony and silver, and occasionally is accompanied by Embolite, the chlorobromide. The other minerals present are iron sulphides (mostly), with small amounts of galena, blende, and chalcopyrite. The gangue is in large part quartz, with a considerable amount of calcite and black oxides of manganese: to this is added much clay and iron oxides from some of the upper workings. The ore contains a small amount of gold, generally \$1 to \$2. The ore is crushed wet, in a converted 50-stamp dry crushing mill, passed over Wilfley tables, and led into four masonry tanks, each of 350 tons capacity, where the pulp is allowed to settle and drain. The large portion of the slimes produced overflow, and are run into pits, and reserved for future treatment.

The cyanide plant proper consists of ten steel vats, 30 ft. in diameter and 4 ft. 6 in. deep over the filters, and of a capacity of 110 tons each. In addition to these, there are two wooden vats of the same diameter and capacity which have just been completed.

The solutions from the treatment tanks drain into 3 cement sumps of an aggregate capacity of 90 tons; from these they are pumped by 12-in. centrifugal pumps to the upper solution tanks, which are two in number and each of a capacity of 20 tons. From these the solutions

\* Paper read before the Institution of Mining and Metallurgy, June 18th, 1903.



pass through five zinc extractors, which are made of steel, each being 18 ft. long, with eight compartments 2 ft. wide, 2 ft. deep, and 2 ft. long. After passing through the extractors the solutions fall into the "strong" and "weak" tanks of 30 tons capacity each, and thence by gravity are led to the twelve treatment tanks already described.

The plant was not designed for any slimes-separation, and without important structural alterations this could not be done. This must be borne in mind when judging of the results obtained.

TABLE I.

|             |     |                    |   |             |           |
|-------------|-----|--------------------|---|-------------|-----------|
| Tank number | 3   | Assay value of ore | { | Gold.....   | \$1.24    |
| Charge "    | 189 |                    |   |             |           |
| Tons (dry)  | 104 |                    |   |             |           |
|             |     |                    |   | Silver..... | oz. 14.24 |

| Date        | Tons of Solution added.       | Strength of Solution % of KCN. | Assay Value of "Tails." |        |
|-------------|-------------------------------|--------------------------------|-------------------------|--------|
|             |                               |                                | Gold                    | Silver |
|             | Filled                        |                                | \$ c.                   | Oz.    |
| Jan. 16.... | 20                            | .37                            | 0 0                     | —      |
| " 17....    | 37                            | .36                            | 0 41                    | 10.98  |
| " 18....    | 26                            | .77                            | 0 00                    | —      |
| " 19....    | 22                            | .78                            | 0 00                    | —      |
| " 20....    | 10                            | .75                            | 0 20                    | 9.39   |
| " 21....    | 15                            | .40                            | 0 00                    | —      |
| " 22....    | 38                            | .32                            | 0 00                    | —      |
| " 23....    | 26                            | .35                            | 0 00                    | —      |
| " 24....    | { Water Washers sluiced out } | —                              | 0 10                    | 6.85   |

Duration of treatment..... 8 days.

Extraction ..... { Silver ..... 51.9%  
Gold ..... 91.9%

TABLE II.

|             |     |                    |   |             |           |
|-------------|-----|--------------------|---|-------------|-----------|
| Tank number | 11  | Assay value of ore | { | Gold.....   | \$2.48    |
| Charge "    | 250 |                    |   |             |           |
| Tons (dry)  | 105 |                    |   |             |           |
|             |     |                    |   | Silver..... | oz. 13.38 |

| Date      | Tons of Solution added | Strength of Solution % of KCN | Strength of Solution With-drawn % of KCN | ASSAY VALUE. |        |        |        |
|-----------|------------------------|-------------------------------|------------------------------------------|--------------|--------|--------|--------|
|           |                        |                               |                                          | Solution.    |        | Tails. |        |
|           |                        |                               |                                          | Gold         | Silver | Gold   | Silver |
|           |                        |                               |                                          | c.           | Oz.    | c.     | Oz.    |
| Mar. 19 { | —                      | —                             | —                                        | —            | —      | —      | —      |
| " 20 {    | 20                     | .28                           | —                                        | —            | —      | —      | —      |
| " 21 {    | 24                     | .28                           | .05                                      | 1.24         | 1.54   | —      | —      |
| " 22 {    | 20                     | .28                           | —                                        | —            | —      | 0.82   | 11.96  |
| " 23 {    | 10                     | .80                           | .10                                      | 1.65         | 2.34   | —      | —      |
| " 24 {    | 12                     | .80                           | —                                        | —            | —      | 0.82   | 10.88  |
| " 25 {    | 10                     | .80                           | .16                                      | 1.81         | 5.39   | —      | —      |
| " 26 {    | 12                     | .80                           | —                                        | —            | —      | 0.20   | 9.69   |
| " 27 {    | 12                     | .80                           | .54                                      | 2.06         | 10.30  | —      | —      |
| " 28 {    | 12                     | .80                           | —                                        | —            | —      | 0.10   | 6.40   |
| " 29 {    | 20                     | .30                           | .52                                      | 1.65         | 2.22   | —      | —      |
| " 30 {    | 20                     | .30                           | —                                        | —            | —      | 0.10   | 6.00   |
| " 31 {    | 20                     | .31                           | .25                                      | 1.24         | 4.72   | —      | —      |
| " 32 {    | 20                     | .31                           | —                                        | —            | —      | 0.10   | 6.00   |
| " 33 {    | 20                     | .28                           | .25                                      | 0.82         | 1.10   | —      | —      |
| " 34 {    | 20                     | .30                           | —                                        | —            | —      | 0.10   | 6.00   |
| " 35 {    | 25                     | .16                           | .23                                      | 0.10         | 0.85   | —      | —      |
| " 36 {    | 10 water               | —                             | —                                        | —            | —      | —      | —      |
| " 37 {    | 10 "                   | —                             | .07                                      | 0.10         | 1.09   | —      | —      |
| " 38 {    | Sluiced out            | —                             | —                                        | —            | —      | 0.10   | 5.98   |

Duration of treatment..... 9 days.

Extraction ..... { Gold..... 95.98%  
Silver ..... 55.24%

## TREATMENT.

With but little to guide them, and before being able to arrive at fairly definite conclusions, the authors worked with solutions of greatly varying strength and tonnage—the strength of the "weak" solution varying from .25% to .7%, and that of the "strong" from .7% to 1.25%, the tonnage of solutions used varying from one to three tons per ton

of ore. The amount of cyanide and of zinc consumed was gradually brought down from 6 lb. and 1½ lbs. to about 4 lb. and 1 lb. respectively.

The present treatment, briefly, consists in the introduction, from the bottom, of about 25 tons of "weak" solution of .30% strength, which is allowed to "soak" for about six hours. This is followed by 30 to 35 tons of "weak" solution of same strength, which is in turn displaced, after 36 hours from commencement, by about 60 tons of "strong" solution containing .75% of cyanide. These 60 tons are turned on from the top, with intervals of "soaking" varying from three to six hours. After this more "weak" solution is added, amounting to about 160 to 180 tons, and finally the treatment is completed by water washes.

The solutions are titrated immediately before and after passing through the ore, and both solutions are kept separate and assayed daily for silver and gold.

Tables I and II are the actual record of the working of two typical tanks.

Although the ore is crushed through a 20-mesh screen with an average height of discharge of 2½ in., the slimes-forming material is such that over 60% of the pulp passes through a 100-mesh and more than 25% through a 200-mesh. In order to show the action of the cyanide solutions upon the various particles, and the distribution of values, Table III is appended:—

TABLE III.

## SIZING TEST.

|             |     |                    |   |             |           |
|-------------|-----|--------------------|---|-------------|-----------|
| Tank number | 11  | Assay value of ore | { | Gold.....   | \$2.48    |
| Charge "    | 250 |                    |   |             |           |
|             |     |                    |   |             |           |
|             |     |                    |   | Silver..... | oz. 13.38 |

| Mesh      | % of Weight | Assay Value |        | % of Value of Original Ore. |        | Assay Value after Treatment |        | % of Extraction of Silver |                                |
|-----------|-------------|-------------|--------|-----------------------------|--------|-----------------------------|--------|---------------------------|--------------------------------|
|           |             | Gold        | Silver | Gold                        | Silver | Gold                        | Silver | On sized particles        | Calculated on total extraction |
|           |             | \$ c.       | Oz.    | %                           | %      | \$ c.                       | Oz.    | %                         | %                              |
| Stayed on |             |             |        |                             |        |                             |        |                           |                                |
| 30        | 10.35       | 2.48        | 13.10  | 10.35                       | 10.13  | 0.20                        | 9.19   | 29.85                     | 3.02                           |
| 50        | 13.00       | 2.06        | 12.72  | 10.80                       | 12.36  | 0.10                        | 6.60   | 48.11                     | 5.94                           |
| 60        | 15.30       | 1.85        | 11.34  | 11.41                       | 13.00  | Tr.                         | 5.70   | 49.74                     | 6.46                           |
| 80        | 7.50        | 1.65        | 10.16  | 4.99                        | 5.70   | "                           | 4.40   | 56.70                     | 3.23                           |
| 100       | 8.50        | 1.60        | 10.28  | 5.48                        | 6.53   | "                           | 3.90   | 62.00                     | 4.04                           |
| 120       | 9.65        | 1.60        | 9.67   | 6.22                        | 6.97   | "                           | 3.80   | 60.71                     | 4.23                           |
| 150       | 2.70        | 1.85        | 12.56  | 4.03                        | 2.53   | "                           | 3.50   | 79.86                     | 2.02                           |
| 200       | 6.50        | 1.90        | 10.26  | 4.98                        | 4.98   | "                           | 4.30   | 58.09                     | 2.89                           |
| passed    |             |             |        |                             |        |                             |        |                           |                                |
| 200       | 26.50       | 3.80        | 20.30  | 40.60                       | 40.20  | 0.10                        | 7.20   | 64.54                     | 25.94                          |
|           | 100.00      |             |        | 98.86                       | 102.40 |                             |        |                           | 57.57                          |

The above test was made on the same ore and same charge as that shown in Table II. The authors have made many such tests and have found but little variation from the one given in the table.

It is clear from the above that fine crushing has an important bearing on the treatment and the extraction.

In addition to these tests, numerous samples of the tailings before sluicing out were taken in sections, and invariably the assay values of the material gradually increased from the top downwards; although this of course is to be expected, the difference is sometimes so very marked, amounting to several ounces, that the authors were led to believe that oxygenation of the mass is even more important than in the case of gold ores. In order to prove this several charges, after receiving the usual treatment and practically having reached ultimate extraction, were transferred into other tanks, the bottom layer being thus shovelled out last, and becoming the top layer of the fresh tank. Invariably, these charges on being further treated from two to four days with "weak" solution, which had no effect before, yielded from 1 to 3 oz. more silver per ton.



The average extraction is from 50 to 55% of the silver and 90 to 95% of the gold, and the authors think that the silver extraction would be increased by double treatment.

## EXTRACTORS.

The size of these has already been given; the precipitation by means of zinc shavings obtained by cutting zinc sheets in a lathe, is extremely good. The total tonnage of solution passed through each extractor is about 60 tons per 24 hours, this being over one ton of solution per cub. ft. of shavings per 24 hours. The assay of the solutions average:—

|                   |          |       |          |
|-------------------|----------|-------|----------|
| "Weak" solution   | { Gold   | ..... | \$0.80   |
|                   | { Silver | ..... | 2'00 oz. |
| "Strong" solution | { Gold   | ..... | \$1.00   |
|                   | { Silver | ..... | 3'75 oz. |

After passing through the extractors the solutions assay a trace of gold and from '02 to '08 oz. of silver.

The precipitation is always accompanied by a very brisk evolution of hydrogen gas. The amount of precipitate to be dealt with is, as might be expected, very large, and its assay value averages silver 20,000 oz., and gold \$8,000 per ton.

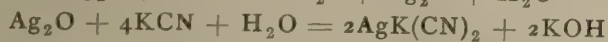
The ore being filled wet, containing sometimes as much as 25% moisture, there would be an accumulation of "weak" solution. In order to avoid this, the first few tons of "weak" and the last water washes, as required, are run through a "waste" solution zinc extractor, the amount of cyanide lost is small, whilst practically all the bullion is extracted from these "waste" solutions.

*Consumption of Cyanide, Zinc, etc.*—The average duration of the treatment is 10 days, including one day for sluicing and filling.

The consumption of cyanide per ton of ore is fractionally less than 4 lb., whilst that of the zinc is about 1'1 lb. The amount of cyanide consumed is very large, compared with that in the cyanidation of gold ores, and, although the authors are unable to account analytically for all this consumption, they believe that it is due to a variety of causes which may be classified under the following heads, viz.:—

1. "Cyanides" in the ore, such as manganese minerals, copper, and iron sulphides, viz.:—
2. The proportionately larger amount of metal to be dissolved which, if compared with a 10-dwt. gold ore, means a proportion of nearly 30 to 1.
3. The complex and obscure re-actions taking place between the silver minerals and the cyanide.

Without entering into the chemistry of these re-actions, which in themselves are sufficient matter for much discussion, the authors think that the solution of the silver sulphides might be explained by the following equations; re-actions in which the presence of alkalies would seem to be necessary:—



Whilst with the Halides the following would take place—



The authors admit, however, that their research in this direction has been very limited owing to want of time, and their explanation of the re-actions is only tentative. There seems to be no direct action between the silver sulphides and the cyanide, and undoubtedly they are most refractory to the treatment by cyanide.

The acidity of the ore calls for an alkalinity of 1 lb. pure lime per ton.

*Working Costs.*—A table of working costs, which explains itself, is appended.

TABLE IV.

## AVERAGE COST OF CYANIDING.

|                                      |              |
|--------------------------------------|--------------|
| Potassium cyanide, 4 lb, at 65c..... | \$2.60       |
| Zinc, 1'1 lb, at 25'5c.....          | 0.28         |
| Lime.....                            | 0.03         |
| Filling and sluicing out.....        | 0.19         |
| Wages.....                           | 0.18½        |
| Sampling, assaying, &c.....          | 0.17½        |
| Maintenance, filters, &c.....        | 0.01½        |
| Management.....                      | 0.15         |
| Treatment of precipitates.....       | 0.05½        |
|                                      | <hr/> \$3.68 |

Mexican money, say 5s. 10d. per ton of 2,000 lb.

*General Conclusions.*—From the results of their work and experience the authors think that certain conclusions can be drawn, amongst which are the following:—

- (1) The cyanide treatment by percolation is suitable for the economical working of certain low-grade silver ores.
- (2) Fine crushing, and classification of the crushed material, are necessary.
- (3) The success of the treatment is brought about more by a larger tonnage of a weaker solution rather than by a smaller tonnage of very strong solution.
- (4) Thorough oxygenation of the mass is absolutely necessary, and double treatment would appear the most satisfactory practice.

NOTE.—All the gold values are expressed in U.S. currency, the working costs being in Mexican money.

## Asbestos.

BY JOSEPH HYDE PRATT.\*

The sources of supply of commercial asbestos are deposits of two distinct minerals; one is a variety of serpentine known as chrysotile, and the other is a variety of amphibole.

## OCCURRENCE.

The amphibole asbestos is usually found in granitic or schistose rocks, sometimes in pockets, and again in well-defined veins. The chrysotile variety does not occur in a vein formation, but is in seams of varying width, which pinch out and widen, sometimes being thickly clustered together, and again occurring sparingly, and it is always found in serpentine rocks. The demand for the chrysotile asbestos is far in advance of that for the amphibole variety, on account of its being adapted to many more purposes. The amphibole variety can, however, be mined and prepared for market at less expense than the chrysotile variety, and as it makes a cheaper product there is some demand for it for those purposes where its nonconductivity of heat is the principal quality desired, as in the manufacture of fireproof paints, for wall plasters, for packing in the manufacture of fireproof safes and of boiler coverings. Where, however, strength of fiber as well as nonconductivity of heat is desired, as in the manufacture of cloth, ropes, felt, boards, tubes and washers, it is the chrysotile variety that is used.

## AMPHIBOLE ASBESTOS.

There are many sources of supply of the amphibole asbestos known in the United States, but owing to its limited demand and its small value, only those deposits that are the most favorably located for mining and transportation and are near a market can be profitably worked. When one considers that there are used in the United

\* Extract from Reports of U. S. Government Survey, 1903.



States per annum only about 1,000 to 1,500 tons of the amphibole variety of asbestos, valued at \$16 per ton, one can readily understand how the market for this mineral could be easily oversupplied, with a corresponding decrease in price. Unless, therefore, new uses are devised for this variety of asbestos or there is a considerable decrease in the supply of the chrysotile variety, there will be a very limited market for amphibole asbestos.

Considerable development work has been done on this type of asbestos deposits in several different States during 1902, and a number of new companies have been organized to mine and prepare it for the market.

The Connecticut Asbestos Mining Company is developing a deposit in the town of New Hartford, Conn., about 3 miles from the railroad station. The asbestos occurs in a ledge that outcrops strongly for a distance of about 750 feet in length. The outcrop is 20 feet wide, and has been opened in places to a depth of 45 feet. The strike of this seam or vein is northeast-southwest. The company is erecting a plant for preparing the asbestos for market, and hopes to be able to place the product on the market during 1903.

In Bedford County, Va., the American Asbestos Company has obtained control of about 4,000 acres in the vicinity of Chestnutfork post office, about 14 miles south of Bedford City. A number of veins and seams of an amphibole asbestos, from 8 to 50 inches in thickness, has been uncovered, which dip at angles varying from almost perpendicular to 45 degrees. This company is preparing to mine this asbestos on the old Hubbard plantation, which is nearly in the center of the tract.

At a number of places in North Carolina amphibole asbestos has been found in quantity; the more important localities are on Tryon Mountain, Polk County, about 1½ miles west of Skyuka, and in Mitchell County, near Plumbtree. Neither of these deposits was worked in 1902.

The deposits at Sall Mountain, White County, Ga., are the largest producers of asbestos in the United States. They are located at Santee, 12 miles northwest of Clarksville, near the Chattahoochee River, and are operated by the Sall Mountain Asbestos Company. In Habersham County some development work was done at the deposits near Northeast. The Pine Mountain Mica and Asbestos Company is opening some amphibole asbestos deposits in the northeast corner of Rabun County, Ga., about 1½ miles from Russell, S.C., and near the main road from Walhalla, S.C., to Highlands, Macon County, N.C. As described by Mr. Daniel Lesley, president of the company,† the asbestos occurs in several small veins that outcrop on the surface. They have been developed by means of a tunnel run into the hillside for a distance of 60 feet, exposing a seam of asbestos 30 to 40 inches thick, which seems to be the union of several of the small veins observed on the surface. About a mile from this point there is another hill where several veins, 2 to 4 feet in width, have been found, but no exploration has been made as yet to determine their extent or the quality of the asbestos.

The Wisconsin Valley Asbestos Mining Company is developing a deposit of amphibole asbestos near Stevens Point, in Wood County, Wis.

#### CHRYSTILE ASBESTOS.

The basic magnesian rocks that extend northeasterly from Alabama across Georgia, South Carolina, North Carolina, Virginia, Maryland, Pennsylvania, the New England States, and into Canada, are more or less altered to secondary serpentine. In the more northern sections different areas are often completely altered to this secondary rock, while in North Carolina, Georgia, and Alabama there are but very

few areas that have been altered to this extent, although serpentine in small amount has been found at nearly all of them. It is only in those areas in which the rocks have been completely altered to serpentine that the chrysotile asbestos could be expected to occur in commercial quantity.

In the United States the principal work that has been done for chrysotile asbestos is in Vermont. The deposits are located in the northern central part of the State, in the town of Eden, Lamoille County, and in the adjacent town of Lowell, Orleans County, and have been described in previous reports.‡ Although a great deal of development work was done on these deposits, and one company, the New England Asbestos Company, has erected a complete mill for treating the asbestos, there was no production of this material from these deposits in 1902. The company named has purchased some of the better asbestos mines in the Black Lake Thetford district, Canada, and its name has been changed to the New England Canadian Asbestos Company. One of the difficulties to contend with in the production of the Vermont asbestos is the transportation, but if the proposed railroad is built into this section it will undoubtedly lead to the mining and milling of this asbestos on a considerable scale.

In North Carolina there is a promising deposit of chrysotile asbestos near North Wilkesboro, Wilkes County, which is within three-fourths of a mile of the railroad. It occurs in a serpentine formation that is from 75 to about 200 feet in width and can be traced in a general northwest to southeast direction for nearly 600 feet. The deposit has been worked by means of an open cut 100 feet long, which was made on the land of Mr. J. B. Church. The cut varies in depth from 1 to 35 feet, and near the surface the serpentine encountered was badly decomposed, but at lower depths a compact, dark-green rock was found. This harder rock is similar to a bold outcropping of the serpentine that occurs on a low hill about 300 yards a little east of south of this cut on land belonging to Mr. G. W. Hinshaw, of Winston. A similar outcrop of serpentine was observed on the summit of a hill 200 yards nearly north of the cut. In nearly all of this serpentine small seams of the chrysotile asbestos were observed that varied in width from a quarter of an inch to nearly 2 inches, the latter seams being encountered near the bottom of the cut. These seams run at all angles through the rock, and as the firmer serpentine was encountered the asbestos became of better quality. Sufficient work has not been done to demonstrate the actual value of this property as a source of asbestos, but it is worthy of further investigation.

In the range of mountains just north of Ishpeming, Marquette County, Mich.,§ chrysotile asbestos was discovered about twenty years ago, but no special attention was paid to the occurrence until 1893, when specimens were collected and sent to the World's Fair at Chicago. Some attempt was made at that time to interest capital in the further development of the deposits but without success. During the latter part of 1902 some work was done which demonstrated that the asbestos was more plentiful than was at first supposed. It is probable that sufficient capital can now be obtained to carry the development work to the point of determining whether or not there is a commercial deposit of the mineral.

Although there has been some very good asbestos found at the Wyoming deposits, which are in the vicinity of Casper, Natrona County, there was no production of this material in 1902. The serpentine rocks of the Pacific slope in California, Oregon and Washington are promising fields for investigation, and it is possible that some good deposits of the chrysotile asbestos will be opened.

† Mineral Resources for 1900, pp. 862-866, and for 1901, pp. 889-890.

‡ Western Mining World, September 12, 1902.

§ Private Communications.



## CHEMICAL AND MINERALOGICAL COMPOSITION.

There are a number of minerals belonging to the amphibole group that occasionally assume a fibrous structure and are asbestiform in appearance. Where these occur in quantity they can undoubtedly be utilized as commercial asbestos, but they can not be used for the same purposes as the chrysotile variety.

The most common amphibole to assume a fibrous structure is tremolite, which crystallizes in the monoclinic system and whose chemical composition is represented by the formula  $(\text{MgCa})\text{SiO}_3$ , a magnesium-calcium metasilicate. There is nearly always a little iron and alumina present, together with some moisture.

Anthophyllite, the orthorhombic amphibole, has been found with a fibrous structure at a number of localities, and as shown by Dr. George P. Merrill,\* a considerable proportion of the asbestos that is called the amphibole (tremolite) variety is in reality an anthophyllite. It is also true that many specimens which have at first been considered anthophyllite have proved on close examination to be one of the monoclinic amphiboles, and in some cases to be enstatite. Many mistakes of this character have been made in connection with the fibrous minerals occurring with the basic magnesian rocks extending from Alabama in a northeast direction to the Gaspé Peninsula in Canada. These, as a rule, occur in very small quantity. The chemical composition of the anthophyllite is represented by the formula  $(\text{MgFe})\text{SiO}_3$ , a magnesium-iron metasilicate. There is nearly always from a trace to several per cent of alumina and a small amount of moisture found in anthophyllite. Occasionally a pyroxene is observed that has an asbestiform structure, this being more noticeable in the enstatite than in the orthorhombic pyroxene.

The following analyses† illustrate the chemical composition of the tremolite and the anthophyllite varieties of asbestos, and show how readily the anthophyllite, which contains but a very small amount of lime, can be distinguished from the tremolite, which contains over 10 per cent:

*Analyses of Tremolite and Anthophyllite Asbestos.*

| CONSTITUENT                            | I.<br>Tremo-<br>lite | II.<br>Tremo-<br>lite | III.<br>Antho-<br>phyllite | IV.<br>Antho-<br>phyllite |
|----------------------------------------|----------------------|-----------------------|----------------------------|---------------------------|
|                                        | <i>Per cent.</i>     | <i>Per cent.</i>      | <i>Per cent.</i>           | <i>Per cent.</i>          |
| Silica, $\text{SiO}_2$ .....           | 56.96                | 56.26                 | 56.52                      | 56.21                     |
| Alumina, $\text{Al}_2\text{O}_3$ ..... | .52                  | 1.81                  | 3.57                       | 2.78                      |
| Ferrous oxide, $\text{FeO}$ .....      | 1.12                 | 6.40                  | 10.18                      | 8.58                      |
| Lime, $\text{CaO}$ .....               | 13.84                | 11.98                 | Trace                      | .82                       |
| Magnesia, $\text{MgO}$ .....           | 23.90                | 20.85                 | 27.13                      | 28.95                     |
| Manganese oxide, $\text{MnO}$ .....    |                      | Trace                 |                            | Trace                     |
| Ignition, $\text{H}_2\text{O}$ .....   | 2.37                 | 2.65                  | 2.96                       | 2.23                      |
| Total.....                             | 98.71                | 99.95                 | 100.36                     | 99.57                     |

I. From Parkton, Md., George P. Merrill, analyst.

II. From Albemarle County, Va., R. L. Packard, analyst.

III. From Rabun County, Ga., George P. Merrill, analyst.

IV. From Caldwell County, N.C., George P. Merrill, analyst.

As is well known, pyroxene suffers alteration very readily, passing over into some one of the amphiboles, and it is not improbable that considerable asbestos was originally a pyroxene. The fibrous structure of these minerals represents a crystalline phenomenon, and the individual fibers either may be distinct crystals which are more or less perfectly developed in the prismatic zone or may be due to an abnormal cleavage which has been very highly and perfectly developed. There would be a tendency to distortion in the fibers, due to pressure and other forces to which the mineral mass may have been subjected. In some instances it is undoubtedly true that the fibrous structure has been produced by a process of shearing, which has drawn out the

mineral parallel to the vertical axis, so that in the recrystallization it has assumed the fibrous structure.

Dr. George P. Merrill, in his paper already cited,‡ sums up the results of his investigation as follows:

The points brought out in this paper and the suggestions advanced are (1) that a very considerable proportion of the mineral in commercial use and labelled as asbestos in mineral cabinets is in reality anthophyllite, and (2) that the fibrous structure in this case and in that of the true asbestos as well, is due, in many instances at least, to a process of shearing—is, in fact, an exaggerated form of the process of uralitization.

That a great deal of the amphibole asbestos is the result of the alteration of a pyroxene is undoubtedly true, but it is also true that a large proportion of the asbestos represents an original amphibole mineral. It has not yet been definitely determined, however, whether or not this asbestos represents an original crystallization, although there is some evidence in favor of its not being a secondary mineral. Dr. Merrill believes "that the asbestos form is never a result of original crystallization, but is always secondary, the original mineral doubtless being an orthorhombic or monoclinic pyroxene, or perhaps an amphibole." As further stated by Dr. Merrill, there is an ample field for investigation along this line in determining the original character of the different varieties of amphibole asbestos and also their present mineralogical character.

The chrysotile variety of asbestos is an entirely distinct mineral species from the amphibole varieties. It is a fibrous serpentine, whose composition is represented by the formula  $\text{H}_4\text{Mg}_3\text{Si}_2\text{O}_9$ , a hydrous magnesium silicate. Chemically it is readily distinguished from the amphibole varieties by its containing a large percentage of water. Physically, it is more silky in luster and its fibers are stronger and more elastic. In the table below are given analyses of chrysotile, anthophyllite and tremolite asbestos.

*Analyses of Asbestos.*

| CONSTITUENT                   | I.<br>Chrysotile<br>(Canada) | II.<br>Antho-<br>phyllite<br>(Virginia) | III.<br>Tremolite<br>(Georgia) |
|-------------------------------|------------------------------|-----------------------------------------|--------------------------------|
| $\text{SiO}_2$ .....          | 40.57                        | 56.52                                   | 55.81                          |
| $\text{Al}_2\text{O}_3$ ..... |                              | 3.57                                    | 1.66                           |
| $\text{Fe}_2\text{O}_3$ ..... | .90                          |                                         |                                |
| $\text{FeO}$ .....            | 2.81                         | 10.08                                   | 6.81                           |
| $\text{CaO}$ .....            |                              | Trace                                   | 12.74                          |
| $\text{MgO}$ .....            | 41.50                        | 27.13                                   | 21.09                          |
| $\text{H}_2\text{O}$ .....    | 13.55                        |                                         |                                |
| Ignition.....                 |                              | 2.96                                    | 1.81                           |
| Total.....                    | 99.33                        | 100.26                                  | 99.92                          |

I. J. T. Donald, analyst.

II. R. L. Packard, analyst.

III. George P. Merrill, analyst.

The fibers of this asbestos are usually perpendicular or at high angles to the walls, but very rarely they have been observed where they are parallel to the walls. They occur in the serpentine, as a rule, near the source of some local disturbance, as the presence of granitic dikes in the serpentine, or near the contact of the serpentine with the main mass of the country rock. It has not been definitely determined what the causes are for the formation of this fibrous serpentine, but suggestions regarding this matter are considered later under the heading "Canadian asbestos."

## PRODUCTION.

The production of asbestos in the United States during 1902 was chiefly from the mines at Sall Mountain, White County, Ga., with smaller amounts from near Hinsdale, Berkshire County, Mass., the total quantity being 1,005 short tons, valued at \$16,200. This is an increase of 258 tons in quantity and of \$2,702 in value over the pro-

\* Proc. U. S. Nat. Mus., vol. 18, pp 281-292.

† Proc. U. S. Nat. Mus., vol. 18, p. 291.

‡ Proc. U. S. Nat. Mus., vol. 18, p. 289.



duction of 1901, which was 747 short tons, valued at \$13,498. Of this production all but a few tons was amphibole asbestos. In the development work of the Connecticut Asbestos Company there were about 500 tons of asbestos taken out, but none of it was treated or placed on the market. The same is true of the Vermont deposits, although during 1901 it was fully expected that this asbestos would be placed on the market in 1902. The production of asbestos in the United States has never been over 1,200 tons per annum, and when these figures are compared with the amount of asbestos imported, which is almost entirely of the chrysotile variety, it will be appreciated how large is the demand for this variety. In the table following are given the quantity and value of the annual production of asbestos in the United States since 1880, inclusive:

*Annual production of Asbestos, 1880-1902.*

| Year      | Quantity          | Value   | Year      | Quantity          | Value   |
|-----------|-------------------|---------|-----------|-------------------|---------|
|           | <i>Short tons</i> |         |           | <i>Short tons</i> |         |
| 1880..... | 150               | \$4,312 | 1892..... | 104               | \$6,416 |
| 1881..... | 200               | 7,000   | 1893..... | 50                | 2,500   |
| 1882..... | 1,200             | 36,000  | 1894..... | 325               | 4,463   |
| 1883..... | 1,000             | 30,000  | 1895..... | 795               | 13,525  |
| 1884..... | 1,000             | 30,000  | 1896..... | 504               | 6,100   |
| 1885..... | 300               | 9,000   | 1897..... | 580               | 6,450   |
| 1886..... | 200               | 6,000   | 1898..... | 605               | 10,300  |
| 1887..... | 150               | 4,500   | 1899..... | 681               | 11,740  |
| 1888..... | 100               | 3,000   | 1900..... | 1,054             | 16,310  |
| 1889..... | 30                | 1,800   | 1901..... | 747               | 13,498  |
| 1890..... | 71                | 4,560   | 1902..... | 1,005             | 16,200  |
| 1891..... | 66                | 3,960   |           |                   |         |

#### IMPORTS.

In 1902 the total value of the imports of asbestos was \$762,432, an increase of \$70,604 over that of 1901, which amounted to \$691,828. This in turn was an increase of \$335,877 over that of 1900, which was \$355,951, and illustrates the phenomenal increase in the demand in the United States for the chrysotile asbestos.

In the following table is given the value of the asbestos imported into the United States since 1869, inclusive:

*Value of Asbestos imported, 1869-1902.*

| Year ending | Unmanufactured | Manufactured | Total  | Year ending | Unmanufactured | Manufactured | Total    |
|-------------|----------------|--------------|--------|-------------|----------------|--------------|----------|
| June 30—    |                |              |        | Dec. 31—    |                |              |          |
| 1869.....   | \$ 310         |              | \$ 310 | 1885.....   | \$73,026       | \$ 617       | \$73,643 |
| 1870.....   | 7              |              | 7      | 1886.....   | 134,193        | 932          | 135,125  |
| 1871.....   | 12             |              | 12     | 1887.....   | 140,264        | 581          | 140,845  |
| 1872.....   |                |              |        | 1888.....   | 168,584        | 8,126        | 176,710  |
| 1873.....   | \$ 18          |              | 18     | 1889.....   | 254,239        | 9,154        | 263,393  |
| 1874.....   | 152            |              | 152    | 1890.....   | 252,557        | 5,342        | 257,899  |
| 1875.....   | 4,706          | 1,077        | 5,783  | 1891.....   | 353,589        | 4,872        | 358,461  |
| 1876.....   | 5,485          | 396          | 5,881  | 1892.....   | 262,433        | 7,209        | 269,642  |
| 1877.....   | 1,671          | 1,550        | 3,221  | 1893.....   | 175,602        | 9,403        | 185,005  |
| 1878.....   | 3,556          | 372          | 3,908  | 1894.....   | 240,029        | 15,989       | 256,018  |
| 1879.....   | 3,204          | 4,624        | 7,828  | 1895.....   | 225,147        | 19,731       | 244,878  |
| 1880.....   | 9,736          |              | 9,736  | 1896.....   | 229,084        | 5,773        | 234,857  |
| 1881.....   | 27,717         | 69           | 27,786 | 1897.....   | 263,640        | 4,624        | 268,264  |
| 1882.....   | 15,235         | 504          | 15,739 | 1898.....   | 287,636        | 12,897       | 300,533  |
| 1883.....   | 24,369         | 243          | 24,612 | 1899.....   | 303,119        | 8,949        | 312,068  |
| 1884.....   | 48,755         | 1,185        | 49,940 | 1900.....   | 331,796        | 24,155       | 355,951  |
|             |                |              |        | 1901.....   | 667,087        | 24,741       | 691,828  |
|             |                |              |        | 1902.....   | 729,421        | 33,011       | 762,432  |

#### CANADIAN ASBESTOS.

Nearly all the asbestos imported into the United States is obtained from Canada, and is of the chrysotile variety. These deposits are associated with the basic magnesian rocks mentioned above as extending from northern Alabama, in the United States, northeast to Gaspé Peninsula, in Canada. There are three distinct Canadian districts, all in the Province of Quebec, from 60 to 100 miles south and southwest of Quebec. One is in the vicinity of Danville; the second is near Coleraine, Black Lake and Thetford, about 30 miles northeast of the

first; and the third is near Broughton, about 15 miles northeast of the second. All these deposits have good railroad facilities, those near Danville being on the Grand Trunk Railroad and the others on the Quebec Central. There is still another district in the vicinity of Ottawa where asbestos occurs in limited amount, but it has not yet assumed any importance as a producer of this mineral.

Intercepting the serpentine, with which the asbestos is associated, are masses and dikes of a granitic rock; and there is a relation to be inferred between the asbestos and these granitic dikes. In nearly all cases where asbestos is mined, small seams or dikes of the granitic rock are observed cutting the serpentine. On one side of these granitic dikes the serpentine is hard and compact and contains very few and very small seams of the asbestos, while on the opposite side the serpentine is softer, less compacted, contains seams, and in some cases has strong indications of a shearing movement. It is in rock of this character that the asbestos seams are the largest and most abundant.

These seams are often cut off from the denser serpentine by a very sharp and distinct line similar to a fault line. The presence of these dikes of granitic rock would be sufficient cause to account for the cracking and fracturing of the original peridotite rocks, with perhaps a certain amount of a shearing action. In the subsequent alteration of these rocks into serpentine the fibrous or crystalline serpentine, due to recrystallization aided by aqueous reactions, would be formed along these cracks and fractures. Some chrysotile asbestos is undoubtedly formed by a shearing movement, which may be the case where the fibers are parallel to the sides of the seam. In most cases, however, the fibers are at nearly right angles to the sides and were more probably formed as described above.

In this Canadian district the presence of the small granitic dikes is an aid in following the asbestos and should be of considerable assistance in locating favorable places to work from surface indications, if these granitic dikes outcrop on the surface.

The seams of asbestos vary from one-sixteenth of an inch to, rarely, 3 inches in thickness. The fiber, which measures from one-half inch to several inches in length, is put on the market as crude asbestos, and is the profitable product of the mines. The percentage of this quality of asbestos in the rocks is very variable, and from 30 to even 90 tons of rock have to be mined to yield 1 ton of crude asbestos. Besides this, there is more or less very short fiber that is milled and sold as mill fiber or paper stock. The necessary removal of such a very large percentage of waste rock renders it necessary to economize in every way possible in the handling of this rock.

The general method employed for mining this kind of asbestos is by open cuts or pits, as in quarrying; the rock being worked out by benches as far as practical. In most cases drilling is by steam or compressed air, except in the smaller places, where hand drills are employed. Holes are drilled from 8 to 12 feet and the blasting is only intended to thoroughly loosen and shatter the rock. It is then pried out with crowbars, and the pieces containing asbestos are broken by means of heavy sledges and steel wedges to such size that the asbestos can be readily broken out with small hammers. In the smaller mines the waste rock and asbestos are removed by means of a derrick, but in the larger ones cables are used. The asbestos is then transferred to a drying room, and when dry is hammered in order to separate as completely as possible all attached rock and also to separate the fibers. This material is divided into three grades, according to quality, which are known as No. 1 crude, No. 2 crude (white), and No. 3 crude (red). It is shipped in bags of 100 pounds each. The remainder of the asbestos rock, which contains fibers from a minute fraction of an inch to about one-half inch in length is treated in the mills and made into mill fiber or paper stock. This material is first dried, then crushed to the right



degree of fineness, and then passed into the "cyclone," where there is a nearly complete separation of the fibers from the rock. The fibers are thrown on the separating sieves, from which they are drawn away by exhausts. The rock, which during this process has been reduced to a sand, is ejected into bins. This still carries some asbestos, and it is beginning to be used in some quantity, being placed on the market as asbestic. The prices of these various grades of asbestos are about as follows: No. 1 crude asbestos, \$150 to \$250 per ton; No. 2 crude (white) asbestos, \$75 to \$125 per ton; No. 3 crude (red) asbestos, \$50 to \$75 per ton; mill fiber or paper stock, \$20 to \$40 per ton; asbestic, \$1 to \$3 per ton.

The following companies are mining asbestos in these Canadian fields: Bell's Asbestos Company and Beaver Asbestos Company, at Thetford; King Brothers and Johnston's Company, Limited, (A. S. Johnston, manager), at Thetford and Black Lake; the Union mines (T. H. Crabtree, manager), Standard Asbestos Company, Canadian Asbestos Company, Manhattan Asbestos Company, and the Kerr-Murphy Mine at Black Lake; the James Reed Mine at Reedsdale; the East Broughton Asbestos Manufacturing Company, at East Broughton; the Asbestos and Asbestic Company, Limited, at Danville, and the Columbia and Ottawa Asbestos Company, of Ottawa. During the last six months there has been a consolidation of a number of the mines of Black Lake and Thetford, which have been brought under the control of the New England-Canadian Asbestos Company, which also owns asbestos deposits in Vermont.

During the last year two interesting articles have appeared on the Canadian asbestos deposits, one by Mr. W. Mollmann, on Asbestos and its Production in Canada,\* the other by Fritz Cirkel on Vorkommen und Gewinnung von Asbest in Canada.†

#### PRODUCTION OF CANADIAN ASBESTOS.

As nearly all of the asbestos used in the United States is obtained from Canada, the following table, which gives the production of this mineral in that country, will be of interest:

*Annual production of Asbestos in Canada, 1879-1902.*

| Year       | Quantity          | Value     | Year       | Quantity          | Value     |
|------------|-------------------|-----------|------------|-------------------|-----------|
|            | <i>Short tons</i> |           |            | <i>Short tons</i> |           |
| 1879 ..... | 300               | \$19,500  | 1891 ..... | 9,279             | \$999,978 |
| 1880 ..... | 380               | 24,700    | 1892 ..... | 6,042             | 388,462   |
| 1881 ..... | 540               | 35,100    | 1893 ..... | 6,473             | 313,806   |
| 1882 ..... | 810               | 52,650    | 1894 ..... | 7,630             | 420,825   |
| 1883 ..... | 955               | 68,750    | 1895 ..... | 8,756             | 368,175   |
| 1884 ..... | 1,141             | 75,079    | 1896 ..... | 12,250            | 429,856   |
| 1885 ..... | 2,440             | 142,441   | 1897 ..... | *30,442           | 445,368   |
| 1886 ..... | 3,458             | 206,251   | 1898 ..... | *23,785           | 486,227   |
| 1887 ..... | 4,619             | 226,976   | 1899 ..... | *25,536           | 485,849   |
| 1888 ..... | 4,404             | 255,007   | 1900 ..... | *30,641           | 763,431   |
| 1889 ..... | 6,113             | 426,554   | 1901 ..... | *38,079           | 1,186,434 |
| 1890 ..... | 9,860             | 1,260,240 | 1902 ..... | †40,416           | 1,148,219 |

\* Including asbestic.

† Including 10,197 tons of asbestic.

The demand for Canadian asbestos is still increasing, as indicated in the above table. The apparent decided variation in value of the asbestos produced is due to the varying amount of asbestic put on the market. Thus the increase of less than 4 per cent. in value accompanying an increase of nearly 150 per cent. in production of 1897 was due to this fact; and, conversely, the increase of 9.17 per cent. in value in 1898, with a decrease of nearly 22 per cent. in production, was due to a smaller production of the asbestic.

\* The Canadian Mining Review, June 30, 1902, p. 152.

† Zeitschr. für prak. Geol., vol. 11, 1903, p. 123.

The annual dinner of the Institution of Mining and Metallurgy was held in London, England, on the 25th Nov. The new edition of the list of members corrected to August, 1903 has also been issued.

## BOOK REVIEWS.

ORE DEPOSITS—A DISCUSSION.—Reprinted from the Engineering and Mining Journal. Pages, 90; octavo; cloth. Price, \$1.00 postpaid. Engineering and Mining Journal, New York.

This valuable little volume contains a reproduction of the views expressed before the Geological Society of Washington, at two consecutive monthly meetings held early in the present year, and which were afterwards in the columns of the Engineering and Mining Journal. Some important corrections and amplifications have, however, been made in the present volume. The latest opinions on an ever interesting subject are here given clear expression, and will be read with interest by all persons engaged in the practical or theoretical study of ore-bodies valuable to man.

The discussion proper is preceded by an exceedingly able and interesting review of some fourteen pages from the pen of Mr. T. A. Rickard, Editor-in-Chief of the Engineering and Mining Journal. Among the well-known and authoritative writers, geologists, and engineers taking part in the discussion were:—Messrs. S. F. Emmons, W. H. Weed, J. E. Spurr, W. Lindgren, J. F. Kemp, F. L. Ransome, C. R. Van Hise, T. A. Rickard, and C. W. Purington.

THE METALLURGY OF ZINC AND CADMIUM.—By Walter Renton Ingalls. The Engineering and Mining Journal, New York. Pages, 700; profusely illustrated. Price, \$6.00 postpaid.

In this comprehensive, useful and reliable work the author has handled his subject in a manner fully sustaining his acknowledged reputation as the leading authority in all matters relating to modern practices in this branch of metallurgy. Until the publishing of the present volume, no special or extensive treatise on this metal had been printed, although many essays and pamphlets have appeared from time to time describing various processes of treatment in a general way, and some literature concerning it may be found in the files of several technical periodicals and also in the transactions of certain foreign scientific societies, notably French and German, as until recently the Belgian and German engineers are entitled to the credit of being the leaders in the practical application of modern methods in the smelting and refining of zinc ores. In Mr. Ingalls' work minute descriptions are given of many furnaces and processes which are now old and out of date, and also of many new ones which have not so far been put to practical uses. The author has divided his subject into nineteen chapters, containing over 400 cuts and illustrations, and a perusal of the following headings which are fully described in the various chapters, will give some idea of the scope of this exceedingly valuable addition to the mining literature of the country:—Zinc and its Ores, Calcination of Calamine, Blende Roasting. Roasting Furnaces, Utilization of the Sulphurous Gases, General Principles of Zinc Distillation, Retort and Condenser Manufacture, Fuel and Systems of Combustion, Chimneys, Heat Recuperation and Furnace Design, Distillation Furnaces, Practice in Distillation, Losses in Distillation, Refining Impure Zinc and Composition of Commercial Spelter, Cadmium and its Recovery, Cost of Producing Zinc, Design and Construction of Smelter Works, Examples from Practice, Proposals to Smelt Zinc Ore in the Blast Furnace, Manufacture of Zinc Dust, Zinc White, Zinc Sulphate and Zinc Chloride.

DEEP GOLD MINING IN NOVA SCOTIA.—By E. R. Faribault, C.E., Geological Survey of Canada. A report on the best methods of testing the value of the deeper Gold Deposits of Nova Scotia. Printed by order of the Government of Nova Scotia.

During the last session of the Nova Scotia Legislature an Act was passed, entitled "An Act to Encourage Deep Mining in the Gold Fields of Nova Scotia," which, among other things, authorized the appropriation of a sum of money for the sinking of three deep shafts in the gold fields of the province. With a view to the selection of the most suitable locations for these test shafts, the Government deemed it advisable to utilize the intimate knowledge of the gold fields, acquired by Mr. Faribault during his many years field work in the gold districts. The results of this work done by Mr. Faribault, and the conclusions he has arrived at, are fully set forth in the above-mentioned report. The author draws attention to the analogy between the gold reefs of the province and the gold bearing saddle-reefs of the celebrated gold fields of the Bendigo District, in Victoria, Australia. In the latter diggings, shafts have been sunk to, and profitably operated, at depths reaching four thousand feet, and he infers from the similarity of the anticlinal and synclinal folds that there is every probability that the underlying saddle-veins of the province will be found as large in size and as rich in gold as those cropping at the surface. As most of the mining done in Nova



Scotia during the past forty years has been confined to the saddle-veins outcropping near the surface, the consequence is that the richest and most easily worked portions are now almost exhausted.

Mr. Faribault's report will be read with interest by all practical mining men, and should the facts and deductions he has presented be borne out by the work now being prosecuted by the Dolliver Mountain, Richardson, and other mining companies on the lines and recommendations laid down by himself and other members of the Survey, prove satisfactory, there would be cause for equal satisfaction from both an economic as well as a scientific standpoint.

**ECONOMIC MINERALS OF NOVA SCOTIA.**—A catalogue and description of the exhibit of Nova Scotia minerals made for the Provincial Exhibition held at Halifax, September, 1903.

In this catalogue, which was prepared by Dr. Edwin Gilpin, jr., Inspector of Mines, and Deputy Commissioner of Public Works and Mines, is given a description of the various coal measures of the Island of Cape Breton, and also those in Pictou and Cumberland Counties, Nova Scotia. Tables are also shewn illustrating the coal trade by counties for the year ending September, 1902. The production of the various mines and collieries for the same period appears in detail, together with much information respecting the number of engines in use and workmen employed in the industry. Gold mining, in the prosecution of which a very large amount of capital has been employed during the last forty years, is fully dealt with, and many interesting tables have been compiled setting forth the growth of this important source of wealth to the province, amounting as it did during the years from 1862 to 1902 to nearly \$15,000,000. A summary is also included which gives much useful information concerning operations respecting other minerals of economic importance, such as, graphite, oil, limestone, barytes, building stones, &c., fireclay, clay, moulding sand, pyrrhotite, talc, celestite, diatomaceous earth, and various hydrated oxides of iron and manganese used for making paints.

Mentioned in the list of minerals known to occur, but which have not so far been discovered in sufficient quantities to be of economic value, are sulphur, molybdenum, cobalt, nickel, zinc, tin, phosphates and salt. Persons interested in the mineral development of Nova Scotia will find much new and reliable information, which will reward a careful perusal of the pages of this timely pamphlet.

## MEETINGS OF MINING SOCIETIES, &c.

### The Nova Scotia Mining Society—Semi-Annual Meeting.

The semi-annual meeting of the Nova Scotia Mining Society was held at Halifax, on Tuesday, the 19th ulto, and was largely attended. In the absence of the president, Mr. Cornelius Shields, the chair was filled by Mr. Alex. McNeil, the vice-president. The following were among those present:—Alex. McNeil, Port Hood Coal Co.; Alex. Dick, Dominion Coal Co.; James Baird, manager, Maritime Coal Co.; A. A. Hayward, Waverley; G. W. Stuart, manager, N. S. and Mexican Mining Co.; Hugh Fletcher, Geological Survey, Ottawa; C. N. Crowe, manager, Dominion Antimony Co.; F. H. Mason, Halifax; Francis Burrows, general manager, Cumberland Coal and Railway Co.; G. D. Burritt, Halifax; G. J. Partington, manager, Dolliver Mountain Mining and Milling Co.; H. Piers, Halifax; H. S. Poole, Halifax; R. A. C. McNulty, Halifax; Charles C. Starr, J. Starr, Son & Co.; J. H. Austen, Halifax; J. G. Rutherford, Windsor; F. P. Ronan, Halifax; W. C. Milner, Halifax; Prof. Ernest Haycock, Acadia College; H. M. Wylde, Halifax; J. M. Geldert, Halifax; G. E. Francklyn, Halifax; B. C. Wilson, Waverley; D. C. Hood, Dominion Antimony Co.; J. C. Taylor, Sullivan Drill Co.; Hon. S. H. Holmes, Halifax; J. A. Johnson, Halifax; W. B. Ross, Halifax; F. W. Hauwright, Halifax; T. R. Gue, Halifax; M. R. Morrow, Halifax.

During the meeting and since the annual meeting, the following named had been elected to membership in the society:—P. H. Moore, Chester Basin; J. B. Forrest, Port Hood; G. V. White, Sydney; G. H. Gillespie, Ecum Secum; J. C. Taylor, New Glasgow; Francis Burrows, Joggins Mines; Professor Sexton, Dalhousie College.

#### WORK OF PAST MONTHS.

Vice-President McNeil, in touching on the work done since the annual meeting, explained the reasons why the semi-annual meeting had not been held in Sydney as was intended. The majority of the committee, in the facetious language of the vice-president, thought that it would be better not

to go visiting "when a divorce was about to take place in the family," alluding to the condition of the big works at Sydney. At meetings of the executive council the question of legislation to prevent gold stealing had been considered. At the April meeting a resolution of gratification at the introduction into the legislature of a government measure to encourage deep mining in Nova Scotia was adopted. Allusion was made to the securing of the mining exhibit for the provincial exhibition, and to the fact that the society had been incorporated.

#### E. R. FARIBAULT ON DEEP MINING.

One of the first matters that came up at the forenoon session was a letter from Mr. W. L. Libbey, in reference to a report by E. R. Faribault on deep mining in Nova Scotia. Mr. Libbey criticised the report, holding that Mr. Faribault's investigations had been too hastily made to warrant the drawing therefrom of any definite conclusions. It was brought out in the discussion which followed, participated in by Messrs. Partington, Stuart, Poole, Hayward and Mason, that Mr. Faribault's investigation had been merely to find out to which classification the vein on which work was being done belonged. Mr. Hayward expressed doubts as to the correctness of Mr. Faribault's views regarding the Dufferin mine at Salmon River, but it was stated that the location of the shaft in that district was not properly placed. Mr. G. W. Stuart announced an important discovery at Goldenville, confirming Mr. Faribault's views with regard to that district.

#### BETTER MINING REPORTS.

The committee composed of Messrs. Stuart, Drummond and Poole who, at a previous meeting, were appointed to prepare a reply to a request from the Commissioner of Works and Mines regarding the society's request for improvements in the report of the department, submitted a draft of a report. It was decided to send a reply to the following effect:—(1) That the report be written in good English, free from typographical errors; (2) that it be accurate as regards statistics; (3) that appropriate comments be made on accidents that teach a lesson. Comment on the late report of the department would be incomplete without endorsement of the suggestion of D'Arcy Weatherbe, respecting the enforcement of the law referring to the keeping of mine plans, and to ask, with him, why this law has been neglected for so many years in spite of frequent complaints. Examples were quoted of shortcomings in the reports as of late presented.

#### INACCURATE SURFACE PLANS.

It was pointed out that the present surface plans of mining areas are entirely inaccurate. New plans are needed; a new survey is required. It is not so much, one speaker said, that they are wanted but that the province cannot afford to be without them. Mr. Partington, in referring to the inaccuracy of the mining and crown lands plan, mentioned the good work being done by Mr. Weatherbe. Mr. J. G. Rutherford spoke of accidents that had occurred in England through the failure to have plans of the old workings. When he came here he had strongly urged that such be prepared. Mr. Rutherford took occasion to highly commend the work of the Nova Scotia Mining Society.

#### CUMBERLAND COAL AREAS

The afternoon session was made particularly interesting by the presence of Mr. Hugh Fletcher, of the Dominion Geological Survey, who had maps of the coal districts of Cumberland, Colchester and Pictou counties not yet published. Mr. Fletcher made a valuable address, stating that he was giving the information by permission of Dr. Bell, director of the survey. He referred to the geological structure of the southern vein of a coal basin, and the probability that north of the Cobequid hills, between the coal mines of Pictou and Cumberland, workable seams of coal may be present, covered or overlapped by higher rocks, to be reached only by boring. In illustration of this he referred to the fact that, for twenty miles from the Joggins Mines eastward, the worked coal seams dip to the southward; and that at Springhill Mines large seams dip to the westward, but that on the south side of the Cumberland basin these seams do not reappear, but are apparently overlapped by higher rocks. Mr. Fletcher thought it highly desirable that both this basin and another, extending eastward from the neighborhood of Thomson Station into Pictou county, should be thoroughly tested. Explorations for coal in Cumberland and Colchester, until some such test has been made, must be regarded as somewhat of a venture, but one which will warrant the judicious expenditure of capital.

#### MR. J. A. JOHNSON'S IDEA.

Mr. J. A. Johnson congratulated the society on having heard Mr. Fletcher, whose work had been of great advantage to the whole of Nova Scotia. When he (Johnson) had seen that the estimate for this work had been cut down in the House of Commons, he had written to the maritime members



showing them that about all that Nova Scotia got from the Confederation was the work of the geological department, and that now that was cut down. Perhaps Nova Scotia should do this work herself and be independent of the freaks of lithographers who take months to do the work that should be done in days. He was glad to say that the original amount had been restored. He did not think that members of the government, who lie back in luxury and grind out laws, treated with fairness a man like Mr. Fletcher, who had to rough it and who did much valuable work. He thought a much larger appropriation should be made.

Mr. A. Dick said he quite concurred in what had been said. After being in British Columbia he had concluded that the east and the importance of its interests were often overlooked. With our great resources a more generous policy should be displayed towards the east. Could it be that the reason is that we are not sufficiently strenuous in seeking our rights? We should receive from the Government better and more prompt reports of Mr. Fletcher's work. He thought with Mr. Johnson, that the society should memorialize the Ottawa authorities.

#### WORK FOR THE PROVINCE.

Hon. S. H. Holmes believed, on the other hand, that the local government, which receives all the revenues from the coal and minerals of Nova Scotia, should render adequate assistance. The Dominion Government, which has done all that has been accomplished, received no benefit.

Mr. F. W. Hanwright spoke in terms of warm praise of the work of Mr. Fletcher, and said that the results of his work should be made public by the government earlier than they are. Mr. Fletcher's work had been invaluable.

#### THE RESOLUTION ADOPTED.

Mr. Johnson then moved a resolution that, whereas the geological department had for years sent an agent to investigate the coal fields of Nova Scotia, and whereas yearly reports are made accompanied by maps, which the department does not publish; therefore be it resolved, that the Nova Scotia Mining Society memorialize the government that they should at the earliest possible moment, supply those maps to the public. The motion was seconded by Mr. Alex. Dick and passed unanimously. A vote of thanks was tendered to Mr. Fletcher.

Mr. H. S. Poole read an interesting paper on "A trip to the coal region of West Virginia," which was supplemented by a few remarks from Mr. Alex. Dick, of the Dominion Coal Co. pointing out that the ease of mining coal in Virginia and its consequent economy, is somewhat neutralized as compared with Cape Breton in the distance of the Virginia mines from the water, so that Nova Scotia can hope successfully to compete in the markets of the world.

Mr. J. A. Johnson, Halifax, though not a commissioner, said that he would do his utmost to impress on the Exhibition Commission the wisdom of erecting a suitable and artistic building for the accommodation of the mining exhibit. The meeting then adjourned.

#### American Mining Congress.

The sixth annual convention of the American Mining Congress closed its sessions at Deadwood and Lead, South Dakota on September 12th. The day first set for the opening of the congress was Monday, September 7th, but this being Labor Day, no regular business was transacted, and the proceedings were limited to an address of welcome on behalf of the State delivered by Hon. Charles N. Herried, Governor of South Dakota. Mayor E. McDonald also welcomed the delegates on behalf of the citizens of Deadwood. On Tuesday, the 8th, the congress got down to work as on the afternoon of that day the president, Mr. J. H. Richards, of Boise, Idaho, delivered his annual address. Hon. Mr. Shaw, Secretary of the Treasury of the United States, who had come from Washington, D.C., specially for this purpose, delivered an address the same afternoon on "The Mining Industry and Its Relation to American Finances." Amongst other items he gave the value of the product of the mine in the United States as \$1,000,000,000, the proportions contributed by the metallic and non-metallic mineral being about equal. As his estimate of the U.S. production of iron ore Mr. Shaw quoted 30,000,000, tons an amount equalling about one-third of the world's supply, and probably as much as that produced by any other two countries on the globe.

Many excursions were indulged in but probably the most interesting being the one taken to the properties of the Homestake Mining Company at Lead, S.D., where the delegates were ably looked after by the company's staff under the direction of superintendent Grier.

In the course of the meeting many interesting and valuable papers were read, in most cases by their authors, the following is a partial list:—

Dr. Franklin H. Carpenter, Denver, Colorado, "Pyritic Smelting." Dr. J. N. Todd, State Geologist of South Dakota, Vermillion, South Dakota, "The Geology of South Dakota." Mr. Charles W. Merrill, Lead, South Dakota, "The Cyanide Process as Used in the Homestake Mine." Dr. D. C. O'Hara, State School of Mines, Rapid City, S. Dakota, "Geology and Mineralogy of the Black Hills." Prof. J. A. Holmes, Chief Department of Mines and Metallurgy at Louisiana Purchase Exposition, St. Louis, Mo., "The St. Louis Exposition." Mr. Nelson H. Darton, Geological Survey, Washington, D.C., "The Geology of the Black Hills." Mr. J. D. Irving, United States Geological Survey, Washington, D.C., "Ore Deposits of the Northern Black Hills." Hon. C. E. Van Dusen, M.E., Nevada, "Mining Industry in Nevada." Mr. E. W. Parker, Washington, D.C., "Coal." Mr. John Blatchford, Terry, S. Dak., "Practical Mining in Flat Formations of the Black Hills." Hon. George E. Roberts, Director of the Mint, Washington, D.C., "The Production of Gold and Its Relation to the Finances of the Country." Hon. J. L. Webster, Omaha, Neb., "The Money Metals and Their Influence Upon Civilization." Mr. C. L. Dignowity, Boulder, Colo., "The Revelation in Gold Mining and the Economic Treatment of Low-Grade Ores for North Carolina." Mr. C. O. Bartlett, Cleveland, Ohio, "The Drying of Metals." Dr. A. H. Elfton, Silverton, Colo., "The Gold Ores of San Juan Country." Dr. C. Willard Hayes, Assistant Director of the United States Geological Survey, "The United States Geological Survey and Its Relation to the Development of the Mineral Resources of the United States." Mr. Eben Parker Low, Honolulu, Hawaii, "The Mining Resources of Hawaii."

The election of officers for the ensuing year resulted as follows:—J. H. Richards, Boise, Ida., president, re-elected; Thomas Ewing, Los Angeles, Cal., first vice-president; R. C. Patterson, Omaha, Neb., second vice-president; John T. Grayson, Portland, Ore., third vice-president; Irwin Mahon, Carlisle, Pa., secretary. Directors: J. H. Richardson, Ida.; T. Ewing, California; R. C. Paterson, Nebraska; J. T. Grayson, Portland, Oregon; E. F. Brown, Aspen, Colo.; J. Dern, Salt Lake, Utah; J. A. Holmes, Raleigh, N.C.; James H. Lynch, Butte, Mont.; John Gray, Terra-ville, S. Dak.

The seventh annual meeting will be held in Portland, Ore., during the autumn of 1904.

The Iron and Steel Institute of Great Britain will hold its next annual meeting in the United States, as at the conclusion of the last general meeting at Barrow-in-Furness, Mr. C. Kirchhof, of New York, tendered, on behalf of the American members of the Iron and Steel Institute, an invitation to the Institute to hold its next autumn meeting in New York. This invitation, which was endorsed by the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the Franklin Institute, and the American Foundrymen's Association, was, on the motion of the president, accepted by the general meeting with acclamation.

It is proposed that the autumn meeting shall take place in New York on October 24th, 25 and 26th, 1904. After the meeting there will an excursion to Philadelphia, Washington, Pittsburgh, Cleveland, Niagara Falls, and Buffalo, returning to New York on November 10th. During the trip, night travelling will be avoided, and every endeavour will be made to obviate fatigue. The two Sundays will be spent at Washington and at Niagara Falls.

The California State Miners' Association met in San Francisco on November 16th. The session continued for three days.

The first meeting of the Canadian Section of the Society of Chemical Industry was held in the Grill Room of the King Edward Hotel, Toronto, on Wednesday, the 18th inst. Prof. W. R. Lang, D.Sc., in the chair. The following papers were read and discussed:—

1. "The Separation of Gold, Silver and Platinum," by Herbert Carmichael.
2. "The Economic Admission of Steam to Water-gas Generators of the Lowe Type," by Geo. W. McKee.

The next meeting of the Society will be held in Montreal during December.

A meeting of the Eastern Ontario Section of the Canadian Mining Institute took place at the School of Mining, Kingston, on Thursday, the 26th instant. The following papers were read and an interesting discussion ensued:—



1. "Typical Methods of Copper Extraction," by Prof S. F. Kirkpatrick.
2. "Some Notes on Western Coals," by Prof. J. C. Gwillim.
3. "Notes on the Occurrence, Production and Uses of Mica," by E. T. Corkill.

### The Granby Consolidated.

In submitting the annual report of the Granby Consolidated Mining, Smelting and Power Company, Limited, at the meeting held in Montreal recently, the chairman said:—

"Its operations have been greatly hampered by the difficulties that have existed in the coke and coal situation, which have necessitated the running of our smelter plant at practically only one-half of its capacity. We are glad to state that these difficulties have now been overcome, and we look for no further trouble in this direction. Our smelter plant has now been increased by two furnaces, making six in all, which we expect will be run full from now on in place of the average of two furnaces, as was the case last year.

"The mines are now developed so as to produce a very large tonnage without further expenditure in this line. The plant at the mines, and also that at the smelter, are in the very highest state of efficiency. All development work and repairs have been charged to working expenses. Our company has no debt of any kind except current monthly accounts."

The following is a summary of the year's business:—

The production for the year amounted to 12,551,758 lbs.  
 fine copper, 277,574 oz. silver, 35,121 oz. of gold, for  
 which was received ..... \$2,232,741  
 Received from rents and real estate sales..... 38,511  
 ..... \$2,271,252

The above represents the net proceeds at Granby Works, freight to New York, refining and all other charges being deducted from the gross receipts.

#### COSTS.

Working expenses at mine and smelter ..... \$1,136,830  
 Foreign ore purchased..... 72,954  
 Foreign matte purchased..... 766,004  
 ..... \$1,975,789

Net profits for year ending June 30, 1903..... \$295,463  
 Surplus from previous year..... 398,071  
 ..... \$693,535

#### DEDUCT.

Bonus 1,000 shares treasury stock to valued employees..... 10,000  
 Net surplus June 30, 1903 ..... \$683,535

As shown in detail in annexed statement of assets and liabilities.

There has been expended in new construction at the mines and smelter during the year ..... \$207,481

Mine development, 3,127 lineal feet; mine surface stripping, 28,400 cubic yards; Granby ore shipped to smelter, 295,820 tons; Granby ore smelted, 289,583 tons; foreign ore smelted, 7,690 tons; foreign matte treated, 6,130 tons.

#### ASSETS AND LIABILITIES—JUNE 30TH, 1903.

##### ASSETS.

Cost of land, real estate, machinery, buildings, dwellings, equipment, etc..... \$13,845,516  
 Cash, copper in transit and on hand, less advances..... 179,807  
 Store supplies..... 93,913  
 Accounts and bills receivable..... 55,496  
 ..... \$14,174,734

##### LIABILITIES.

Capital stock ..... \$13,363,030  
 Accounts payable, current for month..... 128,169  
 Surplus ..... 683,535  
 ..... \$14,174,734

### Mineral Exports of Tasmania, 1902.

Taken from official sources, the following statement shows the value of the mineral products exported from the above colony during the year 1902. They do not greatly vary from the figures for 1900 and 1901, the differences being mainly due to the variations in prices:—

|                            |             |
|----------------------------|-------------|
| Gold, .....                | £ 170,968   |
| Silver ore, .....          | 193,905     |
| Silver-lead bullion, ..... | 191,034     |
| Tin, .....                 | 237,828     |
| Copper ore, .....          | 59,835      |
| Copper, blister, .....     | 583,795     |
| Copper, matte, .....       | 53,362      |
| Other minerals, .....      | 28,233      |
| Total.....                 | £ 1,318,960 |

Speaking generally as to the mining industry, Mr. Nowell, clerk of the Legislative Council says. "There are abundant opportunities for the employment of capital in mining in Tasmania (which would be immensely increased if a profitable mode of treating the zinc ore in bulk were discovered), but to insure success several requisites are necessary, viz., the nominal capital must be moderate, the working capital adequate for the purpose, the company managed economically, and the mining staff practically conversant with the latest and most successful modes of treatment of the particular kinds of ore to be operated on."

The Treasurer of Tasmania, in introducing the financial measures for the year 1904 remarked:—"There is no doubt that this State possesses very large deposits of tin, which must be worked upon an extensive scale to be made profitable, but this can only be secured by inducing outside capitalists to invest in this branch of Tasmanian mineral wealth."

### Coal Production in the N. W. Territories in 1902.

From the Annual Report of Mr. Arthur L. Sifton, Commissioner of Public Works of the Northwest Territories, we give the following interesting matter concerning the operations in this branch of industry during the year ending 31st December, 1902. It is satisfactory to note that the output during the year dealt with is largely in excess of 1901.

#### COAL PRODUCTION, 1902.

|                                  |               |
|----------------------------------|---------------|
| Bituminous and lignite coal..... | 494,087 tons. |
| Anthracite coal.....             | 16,587 "      |
| Total .....                      | 510,674 tons. |

The figures given in the report for 1901 were:

|                                  |               |
|----------------------------------|---------------|
| Bituminous and lignite coal..... | 331,907 tons. |
| Anthracite coal.....             | 14,742 "      |
| Total .....                      | 346,649 tons. |

It will be noted that the total output for the past year exceeds that of 1901 by 164,025 tons, an increase of over 47 per cent.

The important bearing which the extensive coal areas of the Territories must have upon the future development of the country is now beginning to be realised and it seems quite certain that in the immediate future this industry must of necessity show marked extension in the line of the mining of coal for domestic purposes. Doubtless the great strike in the Pennsylvania coal fields of the United States during the year, and the resulting scarcity of fuel, has done much to direct attention to the inexhaustible coal supplies which we have near at hand, and the fact that the time has now practically arrived when the West can become entirely independent of the East for their fuel supply must have a marked bearing upon the rapid settlement and development of the Territories. It is true that as yet the anthracite coal fields have not been sufficiently developed to justify the hope that fuel of that class can be provided to meet all needs, but as far as the cheaper fuels of the lignite and bituminous coal classes are concerned it is now quite evident that we have an inexhaustible supply of both fuels of this kind.

#### SOURIS DISTRICT.

The area of lignite coal in the south-eastern portion of Assiniboia is now known to be practically inexhaustible and the use of that coal, owing to the improved methods of consumption in stoves, is very rapidly extending, and its use for the generation of steam has also shown a marked extension during the past year owing to the scarcity of other fuels and to the fact that experience has proved that, with proper grates and careful firing, very satisfactory results can be obtained from its use. In this connection it may be noted that a number of the larger steam grist mills in southern Manitoba, and one of the largest mills in Winnipeg, now use Souris coal altogether for the generation of steam. The Souris Coal Company, who now operate the mines previously worked by independent companies at Roche Percee and Coalfields, have extended their works so as to enable them to mine a much larger quantity of coal. The situation of their present works, however, on the banks of the Souris river is such that considerable difficulty is experienced in handling their coal, and a long up-grade haul is necessary before the coal reaches the prairie level for distribution east and west. It is probable that the company referred to will in the near future, find it expedient to abandon their present system of mining and adopt the system of reaching the coal by shafts sunk from the prairie level, with decreased cost of handling and material reduction in the mileage haul from the mines to the distributing centre at Estevan.



## CROW'S NEST PASS DISTRICT.

In the Crow's Nest Pass coal fields, in the Territories, the operations of the Canadian-American Coal and Coke Company at Frank show a marked development during the past year. That company is now putting out a large quantity of coal daily and the colliery promises to become an important one in the near future. Several other mines have been opened up in the district, but none of them have yet got beyond the development stages. Sufficient has, however, been done to clearly prove that the coal areas are of wide extent and of good quality, and there is every indication that in the near future this coal field will be one of the most extensive in the west. None of the coal so far mined has proved of first-class quality for cooking, but the indications are that coal which will make good coke will be located and that the manufacture of coke will be undertaken before long.

## LETHBRIDGE.

At the Lethbridge colliery the company are still extending their operations and the demand for this coal for domestic purposes is rapidly increasing.

## CANMORE.

At Canmore the indications are that the development work done by the company during the past season has now put the colliery on a more satisfactory basis and a large quantity of coal has been mined in that field during the past year, all of which, however, has been utilized for railway operation.

## ANTHRACITE.

The Anthracite mine shows an increase in output over the preceding year, but the deposit on the property owned by the company would seem, from the inspector's report, to have nearly reached the limit of output and, pending negotiations between the company and the owners of the adjoining property on which the anthracite deposits are situated, it seems probable that this mine will not show a marked increase of output in the near future.

## EDMONTON DISTRICT.

In the Edmonton country a marked extension is noted in the opening up of small mines, but I have again to direct attention to the fact that in view of the rapid extension of settlement in the Edmonton district and through the Saskatchewan valley to the east, it seems desirable that the coal mining industry should be taken in hand by a strong financial company and developed upon more permanent and extensive lines than those followed by the small companies, who operate on a hand-to-mouth basis and simply to meet local demands without any reference to the future extension of their workings.

## The World's Production of Gold.

The world's production of gold for the calendar year 1902, as estimated by the Director of the United States Mint, was \$285,888,600. Of this, Canada produced \$20,741,200 and the United States \$80,000,000. The silver production was \$215,861,800—Canada, \$5,546,500; United States, \$71,767,600.

The figures, compared with 1901, show an increase of 1,572,914 ounces of gold, and a decrease of 8,042,934 ounces of silver.

## The Rio Tinto Mine.

An English exchange has the following item respecting the above property which will be read with interest by Canadians as the Mr. Carlyle referred to is none other than Mr. W. A. Carlyle, M.E. who was a few years ago one of the Professors at McGill University and later Provincial Mineralogist of British Columbia:—

The Rio Tinto mine is said to be the largest in the world. It was managed at one time by a Cornishman, Captain Truran, and since then by Mr. William Rich, of Trevu Camborne. The present manager is Mr. Carlyle, a Scotsman. In the past three years under Mr. Carlyle's management, no less a sum than twenty-one millions of dollars has been paid out in dividends. The Rio Tinto has the largest reserve of ore in sight in the world, there being enough to permit of the present rate of extraction for the next 100 years. There are 2,600 men underground. When Mr. Carlyle assumed charge of the Rio Tinto he was beset with labor troubles, and was called upon to settle several strikes. This he did, and now matters are moving along smoothly, and the men are highly satisfied. The Rio Tinto was first worked by the Romans over twenty-six hundred years ago, and is rich in historical lore. There are 11,000 men on the payroll of the Rio Tinto, comprising 75 Englishmen on the staff in charge of departments. Mr. Carlyle,

says he has found the Spaniards excellent workmen. They receive their pay daily, a plan which is found to work well, as it tends to keep the men out of debt. The output of the Rio Tinto is about two million tons of ore per year, half of which is shipped to Europe and America, and sold for copper and sulphur values. About 5 per cent. of the ore is treated by smelting to blister copper in the latest type of American smelting plant. The balance is treated locally by leaching with water, a method distinctive to a few mines in the south of Spain, and no other part of the world. Every twenty-four hours seven million gallons of copper liquor from these leaches are run into canals filled with pig iron and metallic copper is precipitated, known as cement copper, which, with blister copper, is sent to the company's refining plant in Wales. The company turns out about eighty million pounds of copper a year, and it is one of the largest producers in the world, only being exceeded by the Anaconda, in Butte, and the Calumet and Hecla, in Michigan. It is not only the largest copper dividend paying mine, but pays more in dividends than any other mine in the world, with the exception of the De Beers' diamond mines in South Africa. The Rio Tinto pays from six and a half to nine millions a year in dividends, according to the price of copper.

## The Decline of Cornish Tin Mining.

In a recent issue of the *Cornish Post* appears the following letter from Sir Roper Lethbridge, an eminent authority:—

"Sir,—The kindly terms in which you speak of my services to India, as a professor of political economy, as a political agent, and finally as the Press Commissioner of India—whilst criticising my views as to the cause of the decay of Cornish tin mining, and the emigration of so many of our Cornish cousins—are in accordance with the honourable tradition of courtesy to a political opponent held by the English Press; and I thank you for them.

On the Cornish trouble you say:—

'Sir Roper Lethbridge attributes to Free Trade the decline in Cornish mining. We should like to know on what ground. The utmost protection to Cornish mining would not have enabled it to meet the growing demands of the world for tin. Cornwall's chief competitors are British colonies. Over 70 per cent. of the world's production of tin comes from within the British Empire, the bulk of it from the Malay States. Does Sir Roper Lethbridge mean to imply that we ought to stop the production of tin in our colonial possessions? If he does not mean this, then what does he mean?'

Now that is a fair and honourable challenge for open discussion, such as I am always longing to have with a really honest and intelligent Free Trader—so earnestly do I believe that our system of Free Imports must kill our industries and ultimately starve our industrious working men, or force them to emigrate to countries where the fiscal system will give labour the fair chance that is, every day more and more, denied to it in our dear old England.

Well, sir, my first answer to the above statement is, that the writer has forgotten the geography which I am sure he learnt carefully at school. One sentence from the report on our territories in the Malay Peninsula will show this quite clearly, and the writer will at once see that his whole argument is destroyed at a blow. The report states that:

'Tin ore to the value of £6,076,760 was exported from the colony during 1900, but none of this is produced in the colony itself, almost the whole of it being brought from the Federated Malay States.'

Now this is simply a splendid instance of the error that is invariably underlying the arguments of the Free Importers—though those arguments are often adduced in perfect good faith, as I am sure they were by the writer to whom I am replying. And it is also a splendid instance of the way that our existing fiscal system, idiotic at the present day, though well enough suited to the circumstances of fifty years ago, acts to the impoverishment of our working classes both at home and in the colonies, whilst it confers no benefit (or very little) on our richer classes, and only enriches the foreigner.

As an old Indian official, I have some knowledge of the working of this system in this particular case, and ask you permission briefly to state the facts about this foreign production of tin—produced by Chinese coolie labour of the lowest and cheapest type, and, being admitted to our ports, absolutely free, thus enabled, untaxed, to compete most unfairly with the production of our high-class Cornish labour, which certainly, directly or indirectly, pays its quota to the rates and taxes of the country.

The simple facts of the Malay tin industry are these:—

The rich tin deposits of the Malay Peninsula—chiefly alluvial, though a few mines of lode-tin like those of Cornwall have been discovered—are only found in the territories of the Sultans of the Malay States of Trengganu and Kelantan (the Sultan of Kelantan has a tin coinage), which are under the



protection of Siam; and in those of the Sultans of Pahang, Selangor, Perak, and Negri Sembilan, which are under the protection of Great Britain. Of course, not one of these Sultanats is in any sense a British Colony!—not one is included within the British Empire! And yet our beautiful "Free Trade," system enables these happy Malays to send all their tin into the British Colony of the Straits Settlements, and to export it thence over all the world—to the extent, as rightly stated above, of at least 70 per cent. of all the tin in the market—absolutely without one penny of fee, duty or royalty!

Of course, this liberality of our British system—to the foreigner—is most satisfactory to the Malay Sultans. It enables them to levy considerable exports duties at the British frontier—these export duties on tin dumped on to us amount to just half the total revenues of the Sultans of Selangor and Perak!—simply because no duties at all are charged on the British side of the frontier—and still to undersell Cornish tin. In Selangor, in addition to the grand revenue obtained by the Sultan—it has risen from 115,000 dollars in 1875 to 6,303,000 dollars in 1900, owing to our benevolent fiscal system—nearly the whole Malay population are more or less maintained by the tin, the actual mining labour being largely done by Chinese coolies.

And much the same state of things obtains in other States, where Sultans and subjects alike are enriched by the coddling of our benevolent system; and meanwhile, when we hear of Cornish tin mines being shut down because they cannot compete with this protection of the foreigner, benevolent free importers like Mr. Lyulph Stanley suggest that it is well for Cornish miners to 'seek their fortune all over the world,' rather than tax the poor Sultans and proprietors of the Malay States. Now, in the circumstances I have described, I consider that suggestion a cruel one. A Cornishman—who is more than half-brother to a Devonshire man—has far too brave a heart to repine under fair competition. But just consider the real nature of this Malay competition. The tin of the Malay Sultans and their Malay subjects comes into our Colony, and thence into our home markets, subject to no Imperial taxation of any sort or kind. It is mainly produced by Chinese labour, which is subject to no sanitary or social restrictions of any sort, which is able to subsist on the merest pittance, and can be driven to any extent. It can undersell the Cornish tin, and yet enrich its Malay proprietors, not because its 'natural cost of production' is less than that of Cornish tin—for the remoteness and inaccessibility of the jungle-streams where it is found, the comparative untrustworthiness and inefficiency of the cheap labour by which it is worked, the profits of the numerous middlemen that handle it and the immense distances it has to be carried to market, more than make up for the depth and difficulty of the Cornish workings—but simply because of the protection that is afforded to it by our ridiculous fiscal system.

Lest I should be suspected of exaggerating the hard-heartedness of the free importers, in preferring that the Cornish miners should have to emigrate rather than that we should have to pay a fraction more for our Malay tin, I will here give the exact words of the Hon. Lyulph Stanley's letter on the subject. He wrote:—

'Some twenty years ago and more the copper and tin industries of Cornwall began to flag, partly by the reduced yield of the mines, partly by the competition of such districts as Lake Superior and the Malay Peninsula. In 1861 the population of Cornwall was 369,000; in 1871, 362,000; in 1881, 331,000; in 1891, 323,000; in 1901, 322,000. The Cornish miner had sought his fortune all over the world. Mr. Dorman apparently would have retained him in Cornwall by taxing foreign tin and copper. Surely he must see that the whole industry of the country as dependent on tin and copper is more important than the maintenance of Cornish miners in their country practically as annuitants at the cost of the whole community.'

I maintain that it is monstrous to pretend that the Cornish miners would be maintained 'practically as annuitants at the cost of the whole community.' If we were to impose such an import duty on foreign tin as would cause it to contribute to the taxation of the country just so much as, and no more than, Cornish tin indirectly contributes by the rates and taxes paid alike by owners and miners in Cornwall.

The paragraph to which I am replying fully admits 'the growing demands of the world for tin.' Should not Cornwall be allowed to supply that share of the 'growing demands' which she is well able to supply if we cease to protect the foreigner? That is the whole point of my complaint.

Again, the paragraph goes on:—'Does Sir Roper Lethbridge mean to imply that we ought to stop the production of tin in our Colonial possessions?' Certainly not. But let me give the exact figures:—In 1875, out of a total sale of 40,000 tons in the world, Cornwall and our Australian Colonies supplied more than half, or 21,000 tons, Cornwall 10,000 tons, Australasia 11,000 tons, while the foreigners supplied 19,000 tons only, of which 10,000 tons were supplied by the Malays. In 1900, after twenty-five years

of our free import system—I think I have shown above that it is simply ridiculous to describe it as Free Trade—out of a total sale of 75,000 tons, Cornwall and the Colonies combined (including Tasmania and New South Wales) supplied 10,000 tons—less than one-seventh—while the foreigners supplied 65,000 tons, or more than six-sevenths—including 46,000 tons supplied by the Malays, 11,000 tons by the Dutch from their eastern settlements, and 5,000 tons by the Bolivians! Why, if both the Colonies and Cornwall were allowed, by a change in our fiscal policy, to double their present production, even then, in relation to the long-protected foreigner we should be far behind what we were before our free imports encouraged all the world to flood our markets whilst protecting their own by prohibitive tariffs.'

### Mining in the Philippines.

The Philippine Islands have had their full share of inspection and surveillance in the past five years and yet, strange as it may seem, have not yet been surveyed. That the United States Geological Survey might find a wide scope there for some of its activities and render welcome service to the people of the Philippines is a belief entertained by Mr. Henry Gannett, Geographer of the Survey, who has recently returned from the islands, where he has been engaged in taking the census.

In obtaining and compiling information regarding the mineral resources of the islands much valuable work might be done by the Survey. The Insular government maintains now a Bureau of Mines, which has been of conspicuous service in investigating mining titles and in examining several claims, including some coal properties, one of iron and one of copper. No attempt has been made by the Government to investigate or classify the minerals of the islands.

No statistics of production have been obtained. The output has, of course, been extremely limited, but the fact remains that the islands contain a considerable quantity of excellent coal, which is being used for fuel, and that in many a mountain stream Igorrotes are sifting the sands for gold. The hills are even dotted with prospectors who say that the yellow metal may be found there in quartz as well as in placer beds. It may be that the output does not warrant the outlay of time and money that a mineral canvass of the islands would necessitate. A report of that kind, even though the result be negative, would, however, have great interest for those who seek investment in the Philippines. It was formerly said that there was no production of minerals in Cuba or Porto Rico, but the Geological Survey investigated the subject in Cuba for the War Department and the Census Bureau inquired into the condition of things in Porto Rico, and though no astonishing figures of production have been the result in either case, yet the two inquiries have developed a mass of data that may prove interesting to the capitalist, the scientist, and the statistician.

### Coal Production of British India, 1902.

The report of Mr. G. A. Stonier, Chief Inspector of mines in India, for the year 1902, gives the following interesting figures and information concerning the coal mines of this extensive territory, of which comparatively so little is known on this side of the Atlantic:—

The record for 1902 shows an advance on the output for 1901. Coal is again of overwhelming importance and claims nearly 90 per cent. of the total value of the mineral output under the Act. The Bengal coalfields contribute 92 per cent. of the output of coal under the Act, and record an advance of 560,000 tons. At the latter end of the year there was a slackness in Bengal trade, which has continued to date. The Pench River and Chanda coalfields of the Central Provinces and two of the Upper Burma coalfields are being prospected. The following shows the output of coal under the Act according to area in the past two years:—

| Province and mineral area. | 1902.<br>Tons. | 1901.<br>Tons. |
|----------------------------|----------------|----------------|
| Assam.....                 | 220,640 ..     | 253,162        |
| Baluchistan.....           | 33,889 ..      | 22,772         |
| Bengal:—                   |                |                |
| Daltonganj.....            | 19,352 ..      | 3,881          |
| Jherria.....               | 2,420,021 ..   | 2,076,155      |
| Gridih.....                | 776,656 ..     | 691,745        |
| Rajmahal.....              | 219 ..         | 407            |
| Raniganj.....              | 3,053,046 ..   | 2,931,688      |
| Burma.....                 | 13,304 ..      | 12,466         |
| Central Provinces.....     | 197,007 ..     | 191,516        |
| Punjab.....                | 56,373 ..      | 67,730         |
| Total.....                 | 6,790,507      | 6,251,522      |



Apart from the foregoing, 643,465 tons were raised in 1902 from coal-mines not under the Act, as against 597,727 tons in the preceding year. Altogether 7,433,972 tons of coal, valued at Rs. 2,19,54,424, were produced in India in 1902, as against 6,849,249 tons, valued at Rs. 1,98,50,741 in 1901. The advance of the industry has been wonderful—in 1880 only 1,019,793 tons were raised, and in 1895 3,540,019 tons. Bengal yielded 6,269,294 tons, or 84 per cent., and Hyderabad contributed 6 per cent. of the total output of 1902; 340,709 tons (a decrease of 27,515 tons) were won from the cretaceous and tertiary beds, and 7,093,263 (an increase of 612,238) from the Gondwana system. Of the two series in the latter, the Raniganj or Upper coal series yielded 2,217,071 tons and the Barakar or Lower coal series gave 4,876,192 tons. Four concerns contributed 32 per cent. of the total production—viz., Bengal Coal Company 656,611 tons, East Indian Railway Colliery 613,789 tons, the Hyderabad (Deccan) Company 455,424 tons, and the Bird and Company group of collieries 662,213 tons. In Bengal 5,089,004 tons came from European and 1,180,290 from Indian-owned collieries. The output of coke is derived almost entirely from the Bengal coalfields, and in 1902 reached a total of 147,827 tons (a decrease of 9,454 tons)—both hard and soft coke are included. From the figures given below some idea may be found of the marvelous growth of the industry:—

|                                                       | 1880.       | 1890.       | 1901.       | 1902.     |
|-------------------------------------------------------|-------------|-------------|-------------|-----------|
| Imports into India<br>(coal, coke and<br>patent fuel) | Tons.       | Tons.       | Tons.       | Tons.     |
| Indian output.....                                    | 729,058..   | 817,004..   | 237,622..   | 258,026   |
| Total.....                                            | 1,019,793.. | 2,168,521.. | 6,849,249.. | 7,433,972 |
| Export.....                                           | 53..        | 26,649..    | 537,871..   | 430,009   |

Consumption in  
India.....1,748,798..2,958,876..6,499,000.. 7,261,899

One-third of the output is consumed by railways.

The price of Indian coal in Calcutta varied from Rs. 6-8 to 7-8 per ton f.o.b. according to quality; 1903 quotations are from Rs. 5-8 to 6-12 per ton.

The exports to foreign ports amounted to 430,099 tons of coal and coke, or a decrease of 157,772 tons; 428,901 tons, or 99 per cent. of the total were mined in Bengal and despatched from Calcutta.

### The Labor Crisis in the Transvaal and the Gold Output.

The Transvaal has been passing through a long period of unparalleled depression owing to a scarcity of native labor, which all the ingenuity of the mining houses and the Government has been unable to remedy. Ever since the war the mines and farms have failed to attract a sufficient supply of labor, and instead of the unprecedented "boom" which was expected to follow the declaration of peace, there has been one long, unbroken spell of industrial stagnation, until to-day the Transvaal, and more especially the Rand, is in a most unsatisfactory state. The mine owners some months ago began to let it be known that they would not continue indefinitely to await the pleasure of the lazy Kaffirs, and that, if labor could not be got in the country and got quickly, they would not hesitate to go outside the country for it. The Government appointed a Commission to go into the whole question of the native labor supply and requirements of the colony, and this Commission is now hearing evidence. In the meantime the mine owners' agitation in favor of the importation of Asiatic labor is being prosecuted with remarkable energy and public opinion, at first uncompromisingly hostile, is now veering round.

To-day competition for the native is very keen. A railway conference, composed of representatives from the Transvaal and the Orange River Colony, some time ago drew up a programme of railway construction in the two colonies, and the Chamber of Mines, which controls the recruiting of natives for the mines, agreed that the railways—which are owned by the Government—should have not more than 10,000 "boys" for construction work. Since then, however, the depression has become more acute, and a few days ago a deputation from the mining and commercial bodies waited upon the Acting High Commissioner and urged that, as this number could not be set apart for the railway except at grave injury to the economic welfare of the colony, all railway construction should be stopped. Sir Arthur Lawley replied that the Government could not agree to such a drastic course, but that they will reduce new work to the lowest limit, and endeavor, by the use of poor whites, burghers and Britons, and a maximum of machinery, to bring the quantity of native labor required to a minimum. The leaders of the mining industry warned the Government that stamps would have to be stopped should the railways insist upon being supplied with natives for

construction work, and the attitude of the leaders, consequent upon the Governor's reply, will be watched with interest and not without some concern.

Although peace was declared fifteen months ago, the gold output is still little more than half what it was immediately before the war. The following table shows the total output of gold from the whole of the Transvaal since the opening of the fields to the end of the first half of this year:

|                        |            |
|------------------------|------------|
| 1884.....              | £ 10,000   |
| 1885.....              | 6,000      |
| 1886.....              | 35,000     |
| 1887.....              | 169,000    |
| 1888.....              | 967,000    |
| 1889.....              | 1,491,000  |
| 1890.....              | 1,870,000  |
| 1891.....              | 2,938,000  |
| 1892.....              | 4,698,000  |
| 1893.....              | 5,649,000  |
| 1894.....              | 7,809,000  |
| 1895.....              | 8,578,000  |
| 1896.....              | 8,598,000  |
| 1897.....              | 11,476,000 |
| 1898.....              | 16,044,135 |
| 1899.....              | 15,782,640 |
| 1900.....              | 1,457,684  |
| 1901.....              | 1,014,687  |
| 1902.....              | 7,269,888  |
| 1903 (to June 30)..... | 5,579,730  |

£ 101,442,764

The outputs of other industries during last month were: Coal, 219,690 tons, value £85,179; silver, 30,343 fine oz., value £3,133; diamonds, 16,793 carats, value £23,667. The diamond industry promises to develop enormously, a mine of reputed fabulous wealth, the Premier, having been discovered in the Pretoria district. In one month the value of diamonds produced in the colony rose from £2,000 to £15,000, and the industry is only in its infancy.—From DUN'S REVIEW, *International Edition*, for November.

### Mining Concessions in China.

The following note referring to the above mentioned subject is taken from a recent number of the British "Board of Trade Journal."

The development of the mineral resources of China is so important to the national prosperity of the country that the Commissioner of Customs at Wuhu deems it worthy of record in his report for 1902 that various mining concessions have been granted to foreign capitalists. In one case, in the district near Tatung, boring and pumping machinery has been introduced, and preliminary work has been going on for some months under the direction of a foreign expert in coal mining. In other cases, however, little or nothing has been done in the way of practically utilising concessions; and in order to prevent the obtaining of such concessions for purely speculative purposes, every concession should, in the opinion of the Commissioner, be accompanied by a proviso that if practical mining operations are not begun within a certain time limit, and carried on with a definite purpose to fully develop the mines concerned, the concession shall revert to the Government. [For information as to mining developments in China last year, reference should be made to a report (*Annual Series*, 3,092) by Mr. J. W. Jamieson, Commercial Attaché to H.M. Legation at Peking, recently issued by the Foreign Office.]

### New Zealand's Coal Output.

The New Zealand Minister of Mines in his annual report on the coal mining industry of that colony says that the returns from the coal mines show a steady increase, the production for the year 1902 being 1,365,040 tons, or 125,354 tons in excess of the previous year's output. The increases for the several districts are as follows: Northern district, 16,961 tons; west coast district, 84,281 tons; southern district, 24,112 tons; total, 125,354 tons. The total production for the colony during last year for the various classes of coals is as follows:—

| Bituminous and semi-bituminous. | Tons.     |
|---------------------------------|-----------|
| Coal.....                       | 845,046   |
| Pitch coal.....                 | 25,245    |
| Brown coal.....                 | 427,172   |
| Lignite.....                    | 65,239    |
| Oil shale.....                  | 2,338     |
| Total.....                      | 1,365,090 |

The gross recorded output of coal and lignite (including oil shale) now



exceeds 17,000,000 tons. The middle island is the chief source of the coal output of the colony, the west coast mining district affording the supply of bituminous coal. Here the collieries of the Westport Coal Co., Ltd., maintain their pre-eminence, and last year produced 520,086 tons. Brunner colliery had an output of 116,714 tons, and Blackball colliery 99,597 tons. The production at this latter place is limited to the capacity of the aerial tramway, by which the coal is transported to the railway; but when railway connection with the colliery is established there is every likelihood of an increased output. In the southern part of the middle island the collieries at Kaitangata still hold first place in point of magnitude.

### The Metal Trades.

Readjustment in prices of iron and steel has continued during the past month, the decline ceasing only when there was a general curtailment of production. The significance of this altered attitude on the part of producers to consumers abroad is readily perceived. When all plants in the United States were crowded with domestic business, and fancy premiums were charged for prompt delivery, there was no interest in export orders. Now that mills are laying off hands and seeking to curtail expenses, foreign business will not be declined. In fact, there is every reason to expect careful consideration of all offers, whether from home or abroad. During recent years of expansion the plants have extended facilities very largely, and it will be most desirable to keep machinery occupied so far as may be done without actual loss. A small return on the vast capital invested will be more satisfactory than closed mills, especially as it is never desirable to allow hands to seek other localities or a different class of work. There is no prospect of industrial depression in the United States, much new business being constantly offered, and a fairly good tonnage being constantly in sight but new methods and modern processes have been adopted to such an extent that an unprecedented amount of business could be handled at the most economical terms. Consequently, the export market is being sought for the first time in many years.

There can be no uncertainty regarding the situation. Dividends on the common stock of the United States Steel Corporation have been cut in half, and the securities of that company have almost continuously established new low record prices. Output of pig iron is reduced to the extent of a million tons for the last quarter of 1903, after rising well above all previous records. Steel mills at many points are idle or running part time, and still the new contracts are held back in expectation of better terms. Much business is now pending, and with any permanent settlement of the vexed labor problem in the building trades there should appear a healthy inquiry for structural steel.

### Imports of Mining Machinery.

The imports of free and dutiable mining and smelting machinery for the first nine months of the present year compared with 1902, are as follows:—

| MONTHS          | 1903      |          |          | 1902    |          |         |
|-----------------|-----------|----------|----------|---------|----------|---------|
|                 | Free      | Dutiable | Total    | Free    | Dutiable | Total   |
| January .....   | \$ 77,298 | \$ 7,676 | \$84,974 | 92,984  | 2,549    | 95,533  |
| February .....  | 30,106    | 1,587    | 31,693   | 43,123  | 2,380    | 45,503  |
| March .....     | 83,535    | 11,534   | 95,069   | 55,255  | 2,629    | 57,884  |
| April .....     | 104,967   | 4,638    | 109,605  | 61,227  | 5,087    | 66,314  |
| May .....       | 155,493   | 1,469    | 156,962  | 90,820  | 4,782    | 95,602  |
| June .....      | 155,387   | 6,707    | 162,094  | 77,270  | 5,293    | 82,563  |
| July .....      | 128,730   | 4,737    | 133,467  | 47,511  | 2,171    | 49,682  |
| August .....    | 105,838   | 4,083    | 109,921  | 90,798  | 1,139    | 91,937  |
| September ..... | 89,463    | 6,502    | 95,965   | 82,090  | 8,906    | 90,996  |
| Total .....     | 930,817   | 48,933   | 979,750  | 641,078 | 35,936   | 677,014 |

The principal sources from which this machinery has been imported during 1903 were:—

| MONTHS          | UNITED STATES |          | GREAT BRITAIN |          | Other Countries | TOTAL    |
|-----------------|---------------|----------|---------------|----------|-----------------|----------|
|                 | Free          | Dutiable | Free          | Dutiable |                 |          |
| January .....   | \$75,235      | \$ 7,676 | \$ 417        | —        | \$1,646         | \$84,974 |
| February .....  | 29,467        | 1,587    | 639           | —        | Nil             | 31,693   |
| March .....     | 82,680        | 11,534   | 158           | —        | 697             | 95,069   |
| April .....     | 104,902       | 4,638    | 65            | —        | Nil             | 109,605  |
| May .....       | 155,127       | 1,263    | 366           | 206      | "               | 156,962  |
| June .....      | 152,517       | 6,579    | 2,034         | 128      | 836             | 161,094  |
| July .....      | 105,899       | —        | 13,756        | 4,737    | 9,075           | 133,467  |
| August .....    | 100,942       | 3,119    | 4,756         | 964      | 140             | 109,921  |
| September ..... | 82,941        | 6,086    | 5,640         | 416      | 882             | 95,965   |
| Total .....     | 889,710       | 42,482   | 27,831        | 6,451    | 13,276          | 979,750  |

### Imports of Wire Rope.

The following table shows the imports of wire rope and cables for the nine months ending September 30th, 1903:—

| Month                              | From Great Britain |          | From U. S. |          | Total     |           |
|------------------------------------|--------------------|----------|------------|----------|-----------|-----------|
|                                    | Pounds             | Value    | Pounds     | Value    | Pounds    | Value     |
| January .....                      | 115,646            | \$ 8,363 | 16,909     | \$ 2,210 | 132,555   | \$ 10,573 |
| February .....                     | 152,813            | 9,504    | 30,172     | 2,683    | 182,985   | 12,187    |
| March .....                        | 151,408            | 9,038    | 46,602     | 2,607    | 198,010   | 11,645    |
| April .....                        | 148,276            | 8,663    | 20,199     | 2,640    | 168,475   | 11,303    |
| May .....                          | 132,564            | 9,174    | 59,994     | 5,395    | 192,558   | 14,569    |
| June .....                         | 320,882            | 20,047   | 49,312     | 4,028    | 370,194   | 24,075    |
| July .....                         | 192,756            | 12,176   | 68,857     | 6,861    | 261,613   | 19,037    |
| August .....                       | 104,315            | 6,145    | 38,634     | 2,997    | 143,949   | 9,142     |
| September .....                    | 142,671            | 9,927    | 52,773     | 6,806    | 195,444   | 16,733    |
| Imports from other countries ..... | 1,462,331          | 93,037   | 383,452    | 36,227   | 1,845,783 | 129,264   |
| Total .....                        |                    |          |            |          | 92,458    | 6,065     |
| Total .....                        |                    |          |            |          | 1,938,241 | 135,329   |

### Hints for Investors.

Before buying stock, investors should be convinced:—1. That the company whose stock is offered is legally organized. 2. Has a good title to valid mining claims. 3. That those claims contain a sufficient quantity of pay-ore to justify the expenditure of enough capital to equip the property with modern mills and appliances so as to assure dividends. 4. That the property is accessible by either railroad or steamer. 5. That the property is no longer a mere prospect, but that it has been sufficiently developed to satisfy a business man beyond a reasonable doubt that the mine, when operated, will be a producer; and 6. That the affairs of the company, both at the office and at the mine, are in the hands of competent and trustworthy officers and directors.—*Pacific Coast Miner.*



## NEW COMPANIES.

## ONTARIO.

**Belmont Gold Mine, Limited.**—Incorporated under the laws of the Imperial Parliament of the United Kingdom of Great Britain and Ireland, and licensed under the Statutes of Ontario, 9th October, 1903. Authorized capital for use in Ontario, £80,000. D. G. Kerr, C. & M.E., Cordova, Ont., attorney. Formed to acquire the properties known as the "Belmont Gold Mine, Limited."

**Williams Iron Mines Company, Limited.**—Incorporated under the Statutes of Ontario, 14th October, 1903. Authorized capital, \$3,000,000, in 3,000,000 shares of \$1.00 each. Directors: J. E. Buchard, C. C. Williams, J. C. Buchard, M. W. Harden, D. D. Forbes, H. Hulbert, J. McKay. Head office, Sault Ste. Marie, Ont. Formed to acquire the properties known as the "Williams Iron Mines Company, Limited."

**The Bradley Torpedo and Oil Company, Limited.**—Incorporated under the Statutes of Ontario, 14th October, 1903. Authorized capital, \$30,000, in 300 shares of \$100 each. Directors: W. J. Bradley, J. Falconer, H. J. Dawson. Head office, Petrolia, Ont. Formed to acquire the properties known as "The Bradley Torpedo and Oil Company, Limited."

**The Iron and Steel Company of Canada, Limited.**—Incorporated under the Statutes of Ontario, 21st August, 1903. Authorized capital, \$300,000, in 60,000 shares of \$5. Directors: C. E. Carboneau, H. T. Wills, J. F. Wills. Head office, Belleville, Ont. Formed to acquire the properties known as "The Iron and Steel Company of Canada, Limited."

**The Black Cat Gold Mining Company, Limited.**—Incorporated under the Statutes of Ontario, 9th October, 1903. Authorized capital, \$2,000,000, in 2,000,000 shares of \$1. each. Directors: F. W. Whitaker, L. E. Ziegler, G. Kinsey S. P. Kineon, P. S. Briggs, O. M. Bake, E. C. Jones, H. W. Hughes, E. J. Gardner, F. J. Buller, R. C. Levesconte. Head office, Toronto, Ont. Formed to acquire the properties known as "The Black Cat Gold Mining Company, Limited."

**The Clifton Natural Gas Company, Limited.**—Incorporated under the Statutes of Ontario, 14th October, 1903. Authorized capital, \$40,000, in 400 shares of \$100 each. Directors: D. A. Coste, D. McGillivray, W. Marshall. Head office, Niagara Falls, Ont. Formed to acquire the properties known as "The Clifton Natural Gas Company, Limited."

**The Shakespeare Gold Mining Company, Limited.**—Incorporated under the Statutes of Ontario, 21st October, 1903. Authorized capital, \$2,000,000, in 2,000,000 shares of \$1. each. Directors: W. E. Seelye, W. Wood, F. C. Bolin, R. J. Hartley, J. N. Nevers, J. Miller, A. Gowan. Head office, Township of Shakespeare, district of Algoma. Formed to acquire the properties known as "The Shakespeare Gold Mining Company, Limited."

## BRITISH COLUMBIA

**The Poplar Creek Gold Mines, Limited.**—Incorporated under the Statutes of British Columbia, 5th October, 1903. Authorized capital, \$150,000, in 1,500,000 shares of ten cents (10c.) each. Formed to acquire the properties known as "The Poplar Creek Gold Mines, Limited."

**The Monashee Gold Mines, Limited.**—Incorporated under the Statutes of British Columbia, 21st October, 1903. Authorized capital, \$1,000,000, in 1,000,000 shares of \$1. each. Formed to acquire the properties known as "The Monashee Gold Mines, Limited."

**Sharpless Mining and Milling Company, Limited.**—Incorporated under the Statutes of British Columbia, 16th October 1903. Authorized capital, \$300,000, in 300,000 shares of \$1. each. Formed to acquire the properties known as the "Sharpless Mining and Milling Company, Limited."

**The Associated Silver-Lead Mines of British Columbia, Limited.**—Incorporated under the Statutes of British Columbia, 7th October, 1903. Capital is unlimited to consist of shares of \$1. each. Provincial Directors: G. Alexander, W. E. Zwicky, W. S. Drewry, N. J. Cavanagh, L. Pratt, O. V. White, H. Giegerich. Head office, Sandon, B.C.

## COMPANY NOTES

**The Ymir Gold Mines.**—The mine manager reports the return for the month of September, 1903, as follows:—60 stamps ran 27 days, and crushed 4,600 tons (2,000 lb.) of ore, producing 910 oz. bullion. The estimated realisable value (gross) of the product is \$10,000; 260 tons of concentrates, shipped, gross estimated value, \$6,000; cyanide plant treated, 3,050 tons (2,000 lb.) of tailings producing bullion having estimated gross value of \$2,000; sundry revenue, \$1,140; total, \$19,140; working expenses, \$20,000; loss, \$860. There has been expended during month on development, \$5,000. The manager however states that increased working costs are likely to be only temporary and are caused by repairs.

**Hall Mining and Smelting Co.**—The report of the Hall Mining and Smelting Company, Ltd., for the year ended 30th June last, submitted at the meeting on the 29th ult., states that owing to various causes, but chiefly the closing down of many important silver-lead mines, which greatly restricted the supply of lead ore, it was found very difficult to keep on the average more than one furnace in blast and that, for the most part, at very low rates of treatment. While other smelters were entirely closed down for want, not only of ore, but also for want of fuel, the company was however, able to keep one furnace in blast. The Canadian Government having now granted a bounty on lead from ores mined and smelted in Canada, the prospects have much improved for both mines and smelters, and already many mines, which were forced to close down, have recommenced work. It is hoped, therefore, to keep both furnaces in operation profitably during the current year, the producing mines being enabled by the bounty to pay the smelters more adequate rates of treatment.

**Camp Bird.**—The mine manager, reporting for the month of September says: The mill ran 30 days, and crushed 5,608 tons of dry ore. Bullion sales, \$157,666; concentrates sales (381 tons), \$24,346; estimated deposit in cyanide mill, 3,560 tons, which has yielded bullion of an estimated value of \$12,098; total receipts, \$194,110. Working expenses and development (including transportation and treatment of product), \$56,905; balance, \$137,205 (equivalent to, say, £28,115). From this should be deducted the monthly expenses in London (including consulting engineer's fee) of about £700, leaving a profit for the month estimated at £27,415. During the month \$10,680 were expended on construction, making a total for the year commencing 1st May of \$47,092—say, £9,650. Feet of development work, 442."

**International Coal and Coke Co.**—The mining properties of the International Coal Co., a subsidiary organization of the Granby interests, at the eastern end of the Crow's Nest Pass, are being developed, and the new town of Coleman, four miles west of Blairmore, Alberta, is a scene of great activity. Mines are being opened, tipples erected, side-tracks and switches constructed and work has begun on a battery of coke ovens. The Canadian Pacific Ry., on which line the operations are located, has contracted for 1,000 tons of coal per day, and when the mines are all in operation and the coking plant completed this will be one of the largest and most important mining camps in the Northwest.—*Coal Trade Journal*.

**Dominion Coal Company.**—Although over a dozen pumps have been working at Dominion No. 1 pit of the Dominion Coal Company for the past five months the colliery is only about half pumped out; and it will take a few months before it is dry. Mining operations, however, are being carried on simultaneously with the pumping. The output now being about 900 tons a day, which shortly will be increased to about 1,000.

**Tamarac Mine, Ymir Camp, B.C.**—For the past four months work has been in progress at the Tamarac mine, a small force of men being engaged on development in the deepest portion of the mine. The report is current that a fine body of good grade ore has been opened up and that the property is likely to resume its old standing as one of the most important propositions in the camp. That the interest of shareholders has been awakened and that some important steps are likely to be taken shortly is evidenced by the fact that S. S. Fowler, the well known mining engineer, was early in the month engaged for several days in making a thorough examination of the property.

**The Wilcox Mine, Ymir, B.C.**—At this mine, present development is showing up larger bodies of the high grade ore recently shipped. This ore which runs over \$60 per ton and is therefore too rich to pass through the mill, is now being found in such quantities that the average monthly product of the mine is likely to be more than doubled in value. Development on a larger scale has recently been started by which means the rich Fourth of July vein will be opened up at great depth with comparatively little dead work. The No. 2 tunnel on the Wilcox claim proper, which is already in on the No. 2 Wilcox vein about 400 feet is being run further, in such a direction as to tap the Fourth of July vein some 300 feet below the present workings the distance to be driven being less than 400 feet. Several shipments have already been made to the Hall mines smelter under the direction of the manager Mr. Phil White. Twenty-five men are at present working on the property and it is expected that they will be continuously employed throughout the coming winter. It is stated that everything about the mine is in excellent condition and the ore bodies from which the shipments are being made are showing up exceedingly well.

**The Consolidated Lake Superior Co.**—At the annual meeting of the shareholders of the Consolidated Lake Superior Co. which was held at New Haven, Conn., on the 26th ult., 329,000 shares were represented. Vice-President Sanborn, speaking for the holders of 250,000 shares of stock, thought it advisable to re-elect the same board. He said:—"As the company is in the hands of a receiver it would be unwise to make any change at present in the directorate. If the company is re-organized it will become a new corporation and a new directorate will be elected." The following board was then elected: Gordon Abbott, E. J. Berwind, F. H. Clergue, Cornelius Shields, Lynde Harrison, Horatio G. Lloyd, H. K. McHarg, Chas. MacDonald, Chas. E. Orvis, Geo. Philler, S. M. Prevost, Samuel Rea, T. C. Search, Jas. S. Swartz, and Charles H. Tweed. The meeting then adjourned to Nov. 24, to come together in the same city.

**Ore Shipments, Rossland Camp.**—Shipments from the Rossland camp for the week ending October 31st and for the year to date are as follows:

|                        | Week. | Year.   |
|------------------------|-------|---------|
| Le Roi.....            | 5,070 | 175,985 |
| Centre Star.....       | 1,440 | 66,976  |
| War Eagle.....         | 1,110 | 49,215  |
| Le Roi No. 2.....      | 220   | 22,075  |
| Jumbo.....             | 300   | 2,943   |
| Spitzee.....           |       | 300     |
| I. X. L. (milled)..... | 140   | 1,450   |
| Kootenay.....          | 180   | 5,914   |
| Giant.....             |       | 828     |
| Iron Horse.....        |       | 40      |
| Velvet.....            |       | 3,376   |
| White Bear.....        |       | 297     |
| O. K.....              |       | 25      |
| Homestake.....         |       | 90      |
| Totals.....            | 8,460 | 330,574 |

The shipments for the first half of November were as follows:—Le Roi, 4,980 tons; Centre Star, 1,290; Le Roi II, 650 tons; Le Roi II (milled), 350 tons; Jumbo, 250 tons; Spitzee, 30 tons; I. X. L. (milled), 140 tons; Kootenay, 80 tons; War Eagle, 1,200 tons; total for the week, 8,970 tons; year to date, 349,190 tons.

**Le Roi Mine.**—For the month of September the Le Roi mine shows a profit of \$22,500. It is significant however that the ore raised from underground gives three times the profit of that shipped from the dump. Manager S. F. Parrish has cabled to London the following report:—"Shipped from



the mine to the Northport smelter during the past month, 11,583 tons of ore, containing 5,561 ounces of gold, 5,015 ounces of silver and 232,750 pounds of copper. The estimated profit on the ore is \$17,000. Shipped from the dump to the Northport smelter during the past month, 6,277 tons of ore, containing 1,733 ounces of gold, 1,650 ounces of silver, 70,942 pounds of copper; estimated profit on this ore, \$5,250.

The Pall Mall Gazette, referring to the loss of \$20,000 during October, as compared with an estimated profit in September of \$17,000 in the operations of the Le Roi mine, says that the water is low. McMillan is expected to return immediately and he will be able to give an explanation as to the unexpected loss. The management should have learned to be careful from past experience of considerable fluctuations in metallic values resulting from low water.

**Bruce Copper Mines, Limited.**—Calumet, Mich., despatch of Nov. 11, says:—The International Nickel Company which is the reorganized Canada Copper Company, has purchased the famous Bruce mine, which has been one of the best known mines of the west for half a century. The price paid was \$600,000. The mine has been idle for a year or so after a short resumption of operations under Lord Sholto Douglas, before which it was idle 20 years.

**The Wilcox Mine, Ymir, B.C.**—The output of the Wilcox mine for the month of October is again in excess of any previous month. The amount saved on the plates is represented by a gold brick weighing 325 ounces and of an approximative value of \$4,000. In addition to this amount two and a half carloads of rich galena ore have been shipped to the Nelson smelter, the net proceeds on which amount to approximately \$2,500. Concentrates shipped amount further to over \$500 net value, making the total output of the mine over \$7,000 for the month. The running expenses are in the neighborhood of \$2,000 per month so that the company is making a profit of \$5,000 on the month's run.—Nelson Miner.

**Boundary Ore Shipments.**—The combined output of ore for October from Boundary mines is in excess of 70,000 tons, against 63,000 tons for the month of September. The shipments were made up as follows:—

| MINE.                  | TONS.  |
|------------------------|--------|
| Granby Mines.....      | 39,398 |
| Snowshoe.....          | 9,480  |
| Mother Lode.....       | 12,665 |
| Sunset.....            | 858    |
| Morrison.....          | 500    |
| Emma.....              | 2,320  |
| Winnipeg.....          | 990    |
| Oro Denoro.....        | 3,215  |
| Athelstan-Jackpot..... | 820    |

Total for October..... 70,284

**Granby Consolidated.**—The announcement has been made that the Granby Consolidated Mining & Smelting Company has practically decided to pay a dividend of not less than 4 per cent. per annum on the par value of the stock which is \$10 per share. As the stock is now selling at \$4 a share such a dividend would be at the rate of 10 per cent. on the selling price of the stock.

**Crow's Nest Pass Coal Co.**—The output for the Crow's Nest Pass Coal collieries for the week ending Nov. 13 was 16,734 tons; Coal Creek, 6,404 tons; Michel, 6,421 tons; Morrissey, 3,909 tons; total output for the week 16,734 tons; average daily output, 2,789 tons; total output for corresponding week last year, 6,686 tons; average daily output for corresponding week last year, 1,114 tons.

**Dominion Coal Co.**—A Boston correspondent says:—The purpose of Dominion Coal Company to open up additional properties entails capital expenditure. Engineers are already surveying the out-crops on property in order to locate the best available localities upon which to open up three additional mines, all three of which it is proposed to operate by slopes and to be equipped with most modern machinery. The opening up of new mines is the only way in which the output of the company can be materially increased, and it is figured the opening up of such mines will increase the output 40 p.c. which would bring production up to about 4,200,000 tons per annum. It will take two or three years, however, to complete this work, entailing an expenditure of several million dollars. President Ross has in mind an adjustment of the capitalization of the Dominion Coal Co., and when financial conditions enable the carrying of his plans into effect the capital of Dominion Coal Company will be made large enough to meet all immediate and future needs.

The total shipments of coal by Dominion Coal Company for ten months ending Nov. 1 were 2,356,633 tons, as compared with 2,436,367 tons for the corresponding period last year. The decline is accounted for by the fire at the mine.

**The Mollie Gibson Mine, B.C.**—No word has yet arrived from the east regarding the resumption of work on the Mollie Gibson mine, and it is feared now that nothing is likely to be done this season, as the snow is on the ground at the mine, and is not likely to go off again till next spring. All the mine buildings were destroyed in the snowslide last Christmas night, and owing to the location of the workings, which are above the timber line, the erection of new buildings after the snow once comes is very difficult.

**The Oil Business.**—The New Brunswick Petroleum Company, Ltd., of Moncton, whose property is at Memramcook, will shortly begin the erection of a refinery. A Bradford, Penn., man is now on the property, along with the secretary of the company, looking into the details preparatory to the construction of the refinery. Work will be begun in the near future. Sufficient oil is now being obtained to warrant the provision of this establishment. The refinery will be capable of refining 300 barrels of crude oil per day. These oil fields give promise of becoming a most important industry in New Brunswick.

**The Arlington Mine, Erie, B.C.**—During the month of October the Hastings (British Columbia) Exploration Syndicate, Ltd., shipped 130 tons of ore from the above mine to the Hall Mines smelter at Nelson. The net smelter returns were \$5,395.98 and the expenses in British Columbia were \$3,487.27 leaving a profit of \$1,908.71.

## PERSONAL MENTION.

Mr. W. Farwell, general manager of the Eastern Townships Bank, of Sherbrooke, Que., has been elected president of the Mollie Gibson Mining Company vice Col. S. W. Ray, of Port Arthur, Ont., who has resigned.

"The Dawson Daily News announces that ex-Governor William Ogilvie has left the Stewart river, for the outside. Mr. Ogilvie has been in charge of the Ogilvie dredge in a river concession of which he is manager. Mr. Morley Ogilvie, son of the ex-governor, left some weeks ago, and it is presumed he has gone to prepare the plans for these dredges. The company is keeping the results of its operations on the Stewart this year a secret." [Editors Note]. Mr. Wm. Ogilvie is at present in Texas on a visit while Mr. Morley Ogilvie has been in Ottawa for some weeks.—

Mr. David Stewart has been appointed to the position of assistant to the general manager of the Cumberland Railway and Coal Co., with headquarters at Springhill, N.S. Mr. Stewart also retains pro tem the office of general sales and purchasing agent.

The London Times of a recent date in a two-column article, headed "Hudson's Bay an Ocean Route", incidentally has the following complimentary note in reference to Mr. Albert P. Low of the Geological Survey of Canada, the officer in charge—"Low who commands the expedition, enjoys an enviable reputation among the scientists of the world".

Mr. C. F. McGill has resigned the position of mechanical superintendent of the Canadian General Electric Company's works, at Peterboro, to go to Pittsburg, where he has accepted a similar position with the Westinghouse Company, at a largely increased salary.

Mr. Cornelius Shields, president and general manager of the Consolidated Lake Superior Co., was in Montreal recently en route to Newfoundland. He said that he had every hope that the organization plan would be carried out. There is a large amount on hand for the pulp and veneer mills and he had advised the directors that these mills should be re-opened and the material used as soon as possible.

A recent guest at the King Edward Hotel, Toronto, was Mr. Graham Fraser, of Sydney Mines, N.S., general manager of the Nova Scotia Steel and Coal Company. Mr. Fraser is one of the provisional directors of the new Alliance Bank of Halifax, and his visit revives the rumor of an amalgamation of large financial interests, including the Alliance, the People's Bank of Halifax, the People's Bank of New Brunswick, and the Metropolitan Bank of Toronto, the object being to take over the Gibson lumber interests at Marysville, N.B., on the Miramichi River, and eventually to secure control of the Dominion Iron and Steel Company.

Mr. James Ross announces that Austen King, of Pittsburg, one of the leading coal experts in the United States, has been appointed superintendent of the Dominion Coal Company's mines.

Mr. Irving H. Reynolds will shortly retire from the Allis-Chalmers Company, and the duties of Chief Engineer will be assumed by the engineers in charge of the various departments, these engineers availing themselves of the advice of Mr. Edwin Reynolds, Consulting Engineer of the Company.

Mr. W. F. Robertson, of Victoria, Provincial Mineralogist of British Columbia is on a visit to the east, and will spend some time in Montreal, New York and other cities. On his return to the west he will be accompanied by Mrs. Robertson, who has been for some months visiting friends in Eastern Canada and the United States.

Mr. James Ross of Montreal, President of the Dominion Coal Company, recently paid a visit to the companies properties in Cape Breton. In company with Austen King of Philadelphia, G. H. Duggan, 3rd Vice-Pres., Hiram Donkin, consulting engineer of the N. S. Steel Co. and C. D. O'Dell, the company's engineer. Mr. Ross made a thorough inspection of the colliery system of the company lasting several days.

An Associated Press despatch from London to the Canadian papers dated Nov. 17th, reads:—B. T. A. Bell, of Ottawa, sails for Canada today on the Bavarian. He says that British capital is much interested in the development of the Yukon. With the hydraulic power that is going into the Yukon the gold output next season will be 25 per cent. greater than this season.

Mr. George S. Waterlow, of London, England, vice-chairman of the Snowshoe Gold and Copper Mines, Ltd., in the Phoenix camp, as well as one of the directors of the Le Roi mine at Rossland has lately been on a visit to British Columbia to look after the various properties in which he is interested. He was accompanied by Mr. Anthony J. McMillan a fellow director in the Snowshoe Company.

Mr. J. Burr Tyrrell, formerly of the Geological Survey here, but now practicing his profession in the Yukon as a geological expert, has just won the libel suit brought against him by W. A. Beddoe, editor of the Dawson News. The action arose over the publication in the News of an affidavit over Mr. Tyrrell's signature, of a highly sensational nature, in which the accusation was made that the editorial attacks in the News written by Mr. Beddoe and directed against the Bronson & Ray concession, of which the defendant is the resident agent, could be avoided if the latter would consent to "do a little business," give him a certain claim within the boundaries of the concession which he had long desired. Mr. Beddoe indignantly denied the allegation that he could be bribed into changing the attitude of the News towards concessions and the Bronson & Ray concession in particular, and immediately took steps to make Mr. Tyrrell prove his assertion. According to the verdict of the jury Mr. Tyrrell proved it.

Mr. N. A. D. Armstrong, manager of the Yukon Goldfields, Limited, Dawson, is now in England attending the annual meeting of his company.

Among the Canadian members who attended the meeting of the American Institute of Mining Engineers in New York recently were: Mr. P. Kirkegaard, of the Canadian Goldfields, Ltd., Deloro, Ont. Mr. Robert G. Leckie International Nickel Co., Sudbury, and Mr. Wm. J. Sutton, of Victoria, B.C.



Mr. O. E. Prud'homme, of the Geological Survey Department, has just returned from a two month trip to Europe during which he visited the principal art galleries of the continent, including the Louvre in Paris, and other celebrated collections in Milan and Venice.

Mr. Roscoe R. Leslie, formerly superintendent of the Le Roi mine at Rossland, B.C., has left for California, to spend the winter, accompanied by his mother who is in poor health.

It is understood said a recent despatch from Grand Forks, B.C., that A. T. Goodell, manager of the Montreal and Boston Copper Co.'s smelter at Boundary Falls, has resigned. Mr. Goodell will spend the next three months in Spokane prior to accepting an important position in Colorado. He has directed the affairs of the Boundary Falls plant with marked success during the past year and a half. Mr. Goodell is regarded as a leading American metallurgist, having had over fifteen years experience at various smelting plants in the south western states.

## CONCENTRATES.

A case involving the entire aluminum industry was recently decided in New York when the United States Court of Appeals handed down a decision upholding the validity of the so-called Bradley patent for smelting by the use of electricity. The suit was bought by the Electric Smelting and Aluminum Company, of Cleveland, against the Pittsburg Reduction Company, the only concern manufacturing aluminum in the United States, with plants at Niagara Falls and Massena, N.Y.

A Reuter's message from Peshawur states that a coal deposit has been discovered in Koorokh, in the Jagdalak mountains, by employes of the Ameer, who have sent to Kabul many camel loads of coal which, after being subjected to various tests, was found to be particularly useful for fuel in workshops and machine sheds. A number of expert miners and four companies of sappers and miners, under the command of a colonel, with 400 camels, have been sent to the scene of the discovery. It may be recalled that an investigation of coal deposits at Ladda was recently carried out on behalf of the Indian Government, the results of which have not as yet been disclosed.

The Mayor of Dawson, in an interview with the "Vancouver Province" recently said:—In my opinion the production of placer gold in the Klondyke will remain near the \$10,000,000 mark for the next ten years to come, and it may possibly increase through the discovery of new fields and the development of districts now being prospected. Not long ago I was up on the Stewart River, where ex-Commissioner Ogilvie is operating a river dredge. Report on the river had it that Mr. Ogilvie was making good money with his river dredge, but he did not care to make any statement as to his returns. He is prospecting the river, and I do not think he has yet settled down to actual production. The Stewart river district is bound to come to the front within the next year or so.

A mineral survey of Ceylon, restricted to minerals of probable economic value, is at present being conducted at the request of the Government of Ceylon, with the co-operation of the Scientific and Technical Department of the Imperial Institute. Mr. A. K. Coomaraswamy, B.Sc., (Lond.), and Mr. James Parsons, B.Sc., (Lond.), have been despatched to the colony for this purpose.

At Hanley, England, on Oct. 12th, a fire test of uraltite was carried out in the presence of a number of members of the North Staffordshire Institute of Mining and Mechanical Engineers. The test consisted of an ordinary partition constructed of timber protected by uraltite slabs, against which a pile of wood soaked in petroleum was erected and set fire to. The temperature to which one side of this partition was subjected at times reached 1,850 degrees, whilst the other side of the partition remained at atmospheric temperature. In the middle of the fire was also placed a deed box constructed of timber and uraltite. Inside this box paraffin wax, fusible metal and sulphur, and a bundle of papers were placed. When the fire was extinguished, and the box opened, the contents were found unharmed.

**WORLD'S PRODUCTION AND CONSUMPTION OF METALS.**—The figures below show the total world's production and consumption of copper, tin, spelter, lead, nickel, and aluminum in 1901 and 1902. They are compiled from statistics published by the Metallgesellschaft and the Metallurgische Gesellschaft A.G., Frankfurt-on-Main, Germany:—

|                | Production<br>in metric tons. | Consumption<br>in metric tons. |
|----------------|-------------------------------|--------------------------------|
| Copper .....   | 1901..... 517,550             | 536,341                        |
|                | 1902..... 532,700             | 555,628                        |
| Tin .....      | 1901..... 86,598              | 76,263                         |
|                | 1902..... 88,280              | 87,284                         |
| Spelter .....  | 1901..... 507,448             | 506,792                        |
|                | 1902..... 545,349             | 558,929                        |
| Lead.....      | 1901..... 839,000             | 832,721                        |
|                | 1902..... 863,300             | 859,026                        |
| Nickel .....   | 1901..... 8,810               | not given                      |
|                | 1902..... 8,335               | not given                      |
| Aluminum ..... | 1901..... 7,810               | not given                      |
|                | 1902..... 8,110               | not given                      |

**COAL IN AMOV.**—In the early part of last year a British syndicate formed in Hong Kong, acquired from the original native concessionaires certain mining and prospecting rights in the district of Au Chi. This and the adjoining district of Lung Yen appear to be rich in iron and coal of excellent quality. The mines are only some 60 miles inland, but under present conditions the cost of carriage is quite prohibitive, owing to the absence of all transport facilities. The difficulties are not insuperable, and it is in this direction that the introduction of foreign capital and consequent development of industrial activity should be able to rescue the Chinese of this region from their poverty, and enable the trade of the port to emerge from its present stagnation and dull monotony.

A Vancouver, B.C. despatch dated Nov. 5 says:—"The full court sat yesterday on a case where the cause of action is remarkable. Andrew Ferguson staked a claim in the Slocan, which proved to be located on a glacier. The glacier, in the course of time, moved down a hill, taking the mining claim with it, until it overlapped the claim of Ole Sanberb, and now these two claims have come together and got all mixed up. The supreme court judges are now trying to decide who owns the combination claim."

Iron and manganese ores to the value of \$1,776,300 were shipped in 1902 from the Province of Santiago de Cuba, from mines which have been in operation many years.

An English despatch to the "Ottawa Citizen" dated Nov. 17th says:—"A director of three large iron-producing companies which together make one-tenth of the total amount of British pig iron writes a strong letter to the Chronicle calling the government to prohibit the importation of Canadian bounty-fed pig iron. He quotes figures to show that Canada dumped into England in the years 1901-02 nearly as much iron as Germany, Holland, Belgium and America put together. The figures are Germany, Holland, Belgium 78,000 tons; America, 45,000; Canada, 103,000 tons. The article concludes, "This is dumping with a vengeance."

Toronto, Nov. 14th.—Charles L. Bailey, the Canadian manager of the great English steel firm William Jessop & Sons, of Sheffield, left to-day for England to confer with the members of the company in regard to the establishment of a plant in Canada. The concern has decided to build a branch in this country, and would prefer Toronto as a location if satisfactory arrangements can be made with the civic authorities. As the concern would employ about 2,000 hands, it is believed that every encouragement will be offered to secure the industry for Toronto.

Very important discoveries of nickel have been made along the line of the government Temiscaming railway. As a result the government has reserved a strip of land along the line ten miles on either side from the north limit of Widdifield township to New Liskeard. The nickel so far discovered, is about five miles from Haleybury. Some of the deposits show as rich as 44 per cent. of nickel which is far away more valuable than the Sudbury deposit which runs about 3 per cent. Rich silver deposits have also been found within a short distance. Prof. Miller, who is in the district, reports finding one silver lump as big as his hand.

The strike in the slate quarries at Port Penrhyn, North Wales, which has been maintained for the last three years, entailing great expense and suffering upon the families of the workmen, has collapsed early in the present month, the men voting to return to work without having obtained a single concession from the owner, Lord Penrhyn. The strike has been a subject of national interest and was brought up at the last session of Parliament in the hope of settlement, but without avail.

Mr. W. E. H. Carter, of the Bureau of Mines, has just returned from a visit to Copper Cliff, where he inspected the new nickel plant which the Canadian Copper Co. has installed. Formerly the company used to convert the ore to a 30 per cent. matte at its works, and then convey it to the Ontario Smelting Works, a mile away, where it was raised to seventy-five per cent; grade. Now the entire process is done by two furnaces, each with a capacity of 550 tons per day, and the matte is raised to a grade of about eighty per cent. The balance of the refining will still be done in the United States.

A despatch from Sidney, N.S. Wales, dated Nov. 15, says:—"The mining warden at Bulong, near Kalgoorlie, West Australia, reports the discovery of telluride ore at Mulgabbie at a depth of 60 feet. The seam is a foot wide, and samples are assaying four hundred ounces of gold to the ton. The warden is preparing for a great rush. For two miles along the seam the ground is already pegged out. It appears that two men working in the shaft have for weeks been throwing the telluride away in ignorance of its value.

It is estimated that the mining companies operating in the Kootenays,, British Columbia, have paid \$7,500,000 in dividends to date. The Payne mine in the Slocan district is at the head of the list with \$1,420,000 to its credit, and the Le Roi at Rossland is a close second with a record of \$1,305,000. None of the others have paid to exceed \$550,000.—*Pacific Coast Miner.*

An order in council has been passed recently by the Dominion Government permitting the entry into Canada free of duty, of orange mineral, dry white lead and dry red lead, made from lead produced from Canadian ores. In the refining process the substances mentioned are extracted, and it is felt only proper that Canadian products of this kind should be allowed to come into the country again free, as there is no refinery in the Dominion.

## The World's Estimated Production of Pig Lead, 1902.

From Julius Matton's (London) Report for Nov., 1903:—

|                      |         |               |
|----------------------|---------|---------------|
| Spain .....          | 174,936 | English tons. |
| United States.....   | 259,781 | "             |
| Germany .....        | 136,703 | "             |
| Australia .....      | 104,000 | "             |
| Mexico.....          | 95,000  | "             |
| England.....         | 25,504  | "             |
| Italy.....           | 25,897  | "             |
| Greece.....          | 14,000  | "             |
| Belgium.....         | 18,929  | "             |
| Austria-Hungary..... | 13,464  | "             |
| France.....          | 20,000  | "             |
| Japan.....           | 4,000   | "             |
| Sweden.....          | 826     | "             |
| Russia.....          | 400     | "             |
| Canada.....          | 8,335   | "             |
| South America.....   | 225     | "             |
| Total.....           | 902,000 | "             |



### Australia as a Copper Producer.

West Australia promises to become in the near future a great producer of copper, says a correspondent of the *Investor*. Many payable deposits are known to exist on the northwest fields, but until a railroad to the Wilbarra fields is constructed expenses of transportation are too heavy, though many leases are being taken up with a view of securing same before the coming rush, as the railway will undoubtedly be made soon. Nearer to the coast and situated close to the Midland Railway, are some very extensive deposits, which are now being taken in hand by a powerful syndicate connected with the Mount Lyell mines of Tasmania. The copper is in the form of carbonates, and can be easily treated by lixiviation. The formation is traced by prospecting shafts for half a mile, and is about 300 feet wide, and is estimated to average 7 per cent. copper. Fifty thousand pounds worth of ore is in sight. The Phillips River copper and gold fields are also very promising, but at present are a little difficult of access, situated on the extreme southern coast and far from any means of cheap transportation. A good deal of ore of the richer kind has been shipped to Luettens in South Australia from here, but pending the erection of local smelters, the government is arranging to assist the owners of leases by purchasing ores on the spot at a valuation.

### Mineral Production of Cuba.

The following particulars relating to mining operations in Cuba are extracted from a report on the mineral resources of that island in 1901, prepared by the Division of Mining and Mineral Resources, under the direction of the United States Geological Survey, and inserted in General Wood's civil report of 1902:—

The commercial production of metals (in 1901) was confined to the Province of Santiago de Cuba and included only iron and manganese. Three companies in Santiago de Cuba produced the iron mined in the island last year, and one company in Santiago de Cuba produced all the manganese taken from Cuba, with the exception of two small special shipments of a few hundred tons each. There was no production of copper save that of a few hundred tons shipped as samples from the Provinces of Santiago de Cuba, Puerto Principe, and Matanzas. Asphalt was produced on a commer-

cial scale in the four Provinces of Habana, Matanzas, Santa Clara, and Puerto Principe. Each of the six provinces contributed to the total production of brick, stone and lime.

The following table shows the quantity and value of minerals produced in 1901:—

|                               | Quantity.  | Value.       |
|-------------------------------|------------|--------------|
| Iron.....Tons of 2,240 lbs.   | 555,177    | \$1,240,555. |
| Manganese....."               | 24,104     | 96,791       |
| Copper....."                  | 608        | 120,354      |
| Asphalt....."                 | 4,554      | 38,950       |
| Stone.....Cubic metres.       | 461,025    | 847,781      |
| Lime.....Tons of 2,240 lbs.   | 115,991    | 340,791      |
| Brick and Tile.....Number.    | 34,114,595 | 464,756      |
| Cement.....Tons of 2,240 lbs. | 10,000     | 130,000      |

Total value..... \$3,279,978

The report adds that, although the results of this canvass of the island's mineral resources seem insignificant, the investigation is interesting as showing that, under reasonable promise of political and industrial peace, numerous enterprises will be established for the further development of Cuba's mineral wealth.

The New Brunswick Government has leased the Grand Falls water-power for thirty years to the Electro Manganese Co. for manufacturing purposes. The company manufactures ferro-manganese from wad and bog ores, and has a large plant in operation at Shawinigan Falls, Que.

### POCSON, PELOUBET & CO.

## PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

# LAURIE ENGINE COMPANY

MONTREAL - - CANADA

# IMPROVED

# CORLISS

SIMPLE

COMPOUND

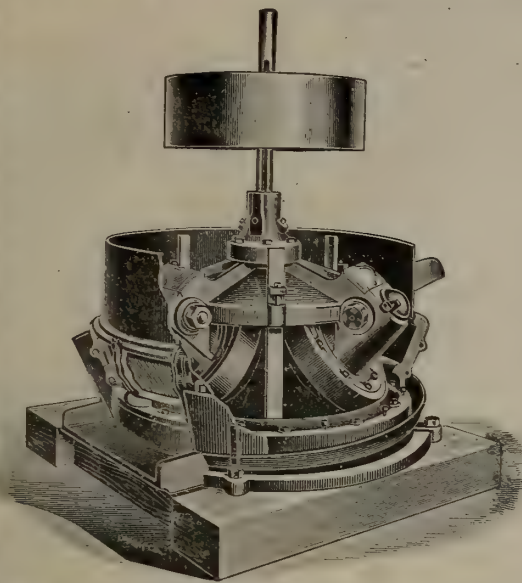
VERTICAL

HORIZONTAL

# ENGINES

FOR ELECTRIC LIGHT and POWER PLANTS.





# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

FOR SALE

## SILVER AMBER MICA PROPERTY

In Eastern Ontario. Has produced over 5,500 pounds of Thumb Trimmed Mica up to 8 by 10 inches in size. Eleven feet of a vein of pink calcite (pink lime). Terms and particulars on application.

**F. E. LEUSHNER,**  
Room 12, Janes Bld., TORONTO, Canada.

Are You Confronted with a  
Difficult Ore-Separating Problem?

## THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO.,** 52 Broadway, New York

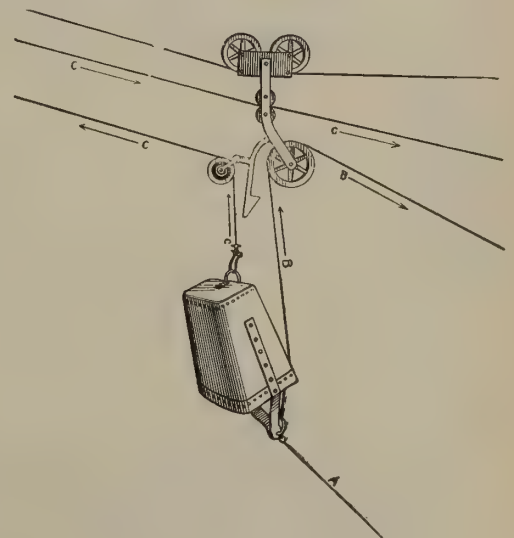
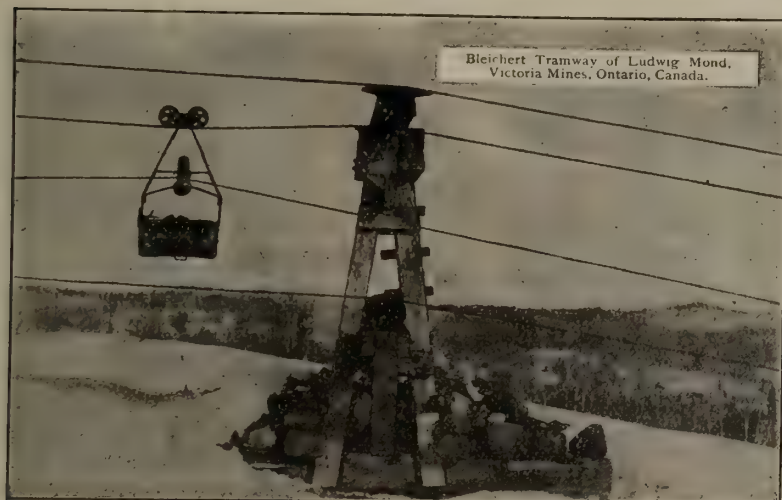
Manufacturing Agents for Canada, **ROBERT GARDNER & SON,** Montreal, P.Q.

# The BLEICHERT

# Wire Rope Tramway

With Patent Locked-Coil Track Cables and Patent Compression Grips.

MORE BLEICHERT TRAMWAYS IN USE THAN ALL OTHERS



Hall Patent Self-filling Bucket and Carriage.

## Cable

## Hoist=Conveyors

Specially Designed for Excavating and Piling

Laurent=Cherry & Hall Patents

No Fall-Rope Carriers required.

Manufactured **The Trenton Iron Co.** TRENTON, N. J.  
..by..

Engineers and Contractors and sole licensees in North America for the Bleichert System.  
New York Office—Cooper, Hewitt & Co., 17 Burling Slip.

Chicago Office—1114 Monadnock Building.

Also, Wire Rope Equipments for Surface and Underground Haulage, etc.  
Illustrated Books on application.



# J. & J. TAYLOR

(TORONTO SAFE WORKS)

TORONTO, ONTARIO

MANUFACTURERS OF

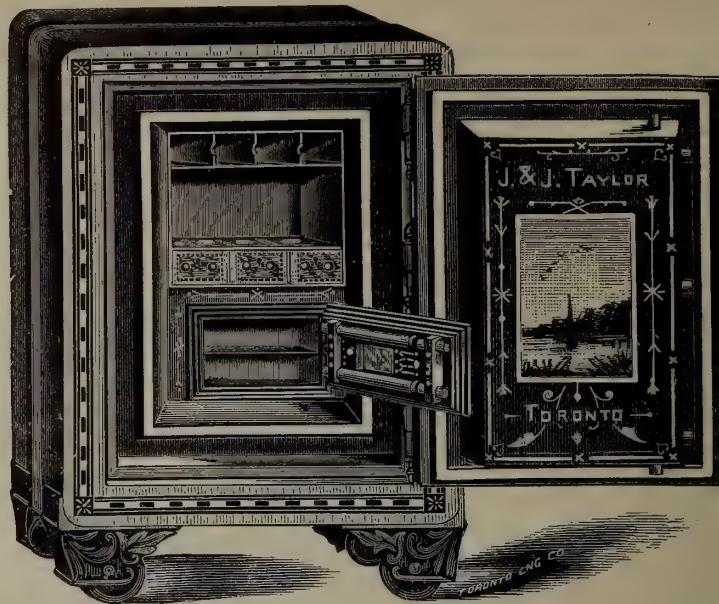
Bankers' Steel Safes

Fireproof Safes

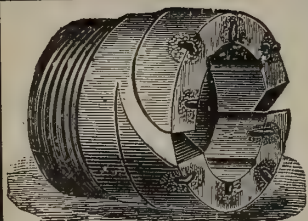
Jewellers' Safes

Vault Doors

Prison Work, &c.



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

## BERNARD BANDLER

IMPORTER OF

## CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



## ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

THE CANADA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

## CHROME STEEL WORKS, BROOKLYN, N.Y., U.S.A.



KENT AVENUE, KEAP  
AND HOOPER STREETS.



Canada Cam.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.

### LUNKENHEIMER VALVES

Lunkenheim Valves are made in endless variety for every requirement, in standard sizes, in bronze and iron, for medium and extra heavy pressures. None but high grade materials and skilled workmanship enter into their makeup. Subjected to rigid test and inspection before shipment. Specify *Lunkenheim* make and order from your dealer. Write for Catalog.

THE LUNKENHEIMER CO., Cincinnati, Ohio, U. S. A.  
Branches: New York, 26 Cortlandt St.; London, 35 Great Dover St., S. E.

## C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.

SPECIALTIES:  
Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes :—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.
2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,

PARLIAMENT BUILDINGS, QUEBEC, P. Q.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

---

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

---

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

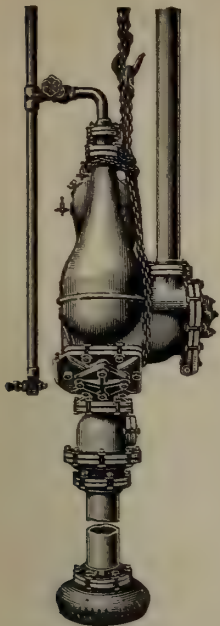
Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**

Commissioner Public Works and Mines,

HALIFAX, NOVA SCOTIA.





# The Pulsometer.

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

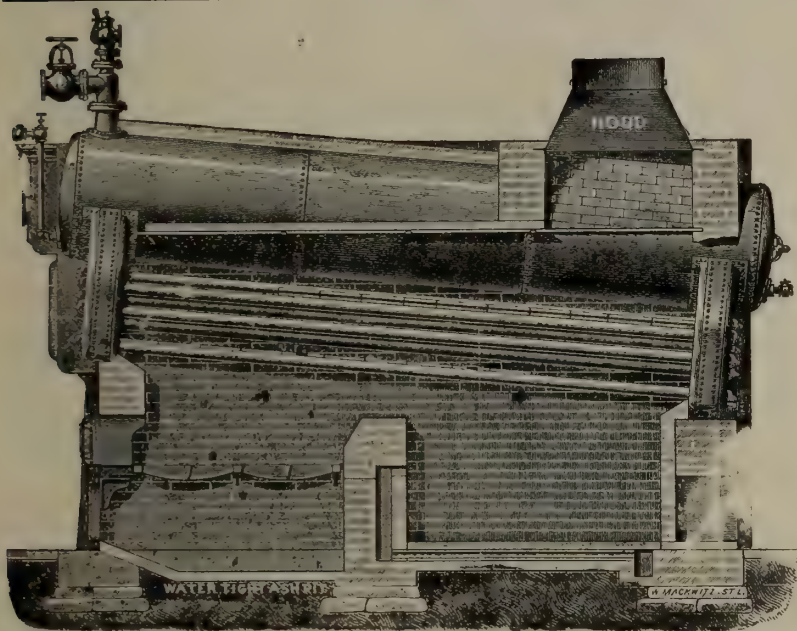
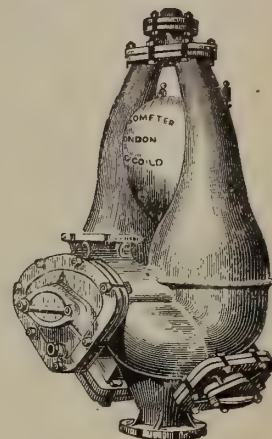
**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

**NOISELESS. NOT AFFECTED BY WEATHER.  
NO SKILLED LABOR REQUIRED.  
MOST ECONOMICAL AND BEST MADE.  
NO EXHAUST STEAM. SIMPLE. DURABLE.**

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL

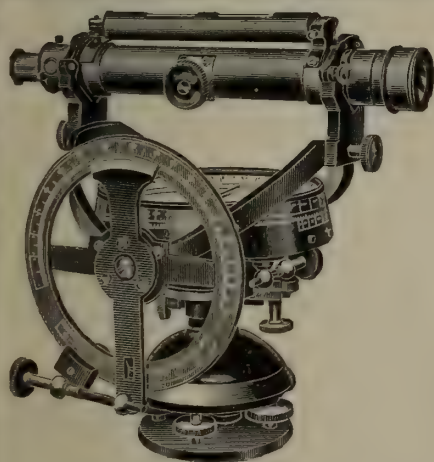


## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.,**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p. and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £27.  
CODE WORD - - Atavis n.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. .... £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

CREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON.

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

**Head Office : 107 ST. JAMES STREET, MONTREAL**

Address : P. O. BOX 396.



# RAILS

Light Mine Rails  
from 8 lbs. per yard  
up . . . . .  
Complete with Plates.  
Bolts and Spikes.  
In stock for  
immediate delivery.

WE ALSO STOCK

The Atlas Car Mover Norton Track Jacks Wire Rope and Fittings, &c.

## W. H. C. MUSSEN & CO.

763-765 Craig St.

MONTREAL

ESTABLISHED 1837

**WIRE ROPE** OF EVERY DESCRIPTION FOR MINES, QUARRIES, ELEVATORS, DREDGES, SAW MILLS, ETC.

**AERIAL WIRE ROPE TRAMWAYS**

SINGLE & DOUBLE ROPE SYSTEMS

**A. LESCHEN & SONS ROPE CO.**

BRANCH OFFICES & WAREHOUSES:  
NEW YORK - 62 CENTRE ST.  
CHICAGO - 186 E. LAKE ST.  
DENVER - 1717 S. MARA PASEO ST.  
SAN FRANCISCO - RIALTO BLDG.

DEPOT: MOUNT BRIDGE, ELEVATION 1400 FT.  
LESCHEN ROPE TRAMWAY, ENCAMPMENT, W.O. LONGEST IN THE COUNTRY.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE  
BETWEEN

Ottawa and Montreal.

Sunday Train Both Directions

PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

Quebec, Halifax, Portland

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

Ottawa, New York and Boston

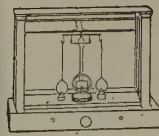
And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket agent of this company or connecting lines.

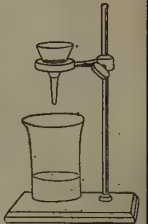
W. P. HINTON,  
Gen'l Passenger Agent.

## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.

## TENDERS.

SEALED TENDERS, marked "Quarry Tenders," will be received by the undersigned on or before noon of the fifteenth day of December, 1903, at the office of the Dominion Iron and Steel Company, Limited, Sydney, Nova Scotia, Canada, for the quarrying, crushing, and delivering f.o.b. vessel, of from 200,000 to 400,000 tons of Limestone per year, to be taken from the quarries of said Company at Marble Mountain, Inverness County, Cape Breton, as per Specifications. Copies of the Specifications can be seen at the Company's Office, together with Blueprints and Photographs, showing Quarry and Plant. Work to begin January 1st, 1904. Contract to be for three years. The party whose tender is accepted will be required to give a bond to the Company with a sufficient surety or sureties of due performance of his contract. The lowest or any tender not necessarily accepted.

(Signed) DAVID BAKER, General Manager,  
Dominion Iron and Steel Co., Limited.

## Mica Properties for Sale

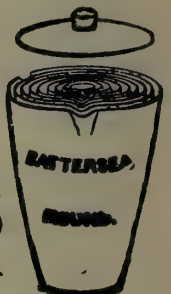
Address

GEO. S. DAVISON

P.O. Box 1069

OTTAWA, ONT.

## Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

### COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.

Battersea Crucibles and Muffles.

Hoskins' Gasoline Furnaces.

Kavalier's Bohemian Glassware.

Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET  
MONTREAL.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

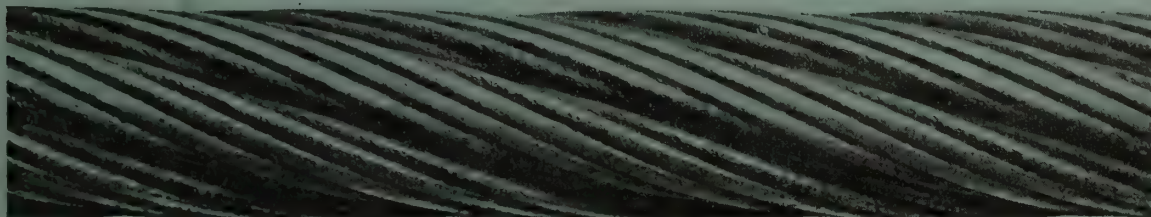
## **WIRE ROPES** for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

Illustration of Winding  
Rope, 240 fms. long x  
3½ circ. Galvanized  
Special Improved  
Patent Steel, Com-  
pound Make, supplied



to Kenneil Collieries,  
Bo'ness, Scot., which  
gave a record life of 6  
years and 2 months.  
Shewing condition  
when taken off.

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

## Drummond, McCall & Co.

**IRON, STEEL and GENERAL METAL MERCHANTS**

GENERAL SALES AGENTS

**Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.**

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steam Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

**General Offices: CANADA LIFE BUILDING - MONTREAL.**

**Montreal Pipe Foundry Co.**

Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

**"LUDLOW" VALVES & HYDRANTS**

GENERAL OFFICES:

Canada Life Building - MONTREAL

**PIG IRON...**

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

**CANADA IRON FURNACE COMPANY, LIMITED**

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

**CANADA LIFE BUILDING, MONTREAL.**

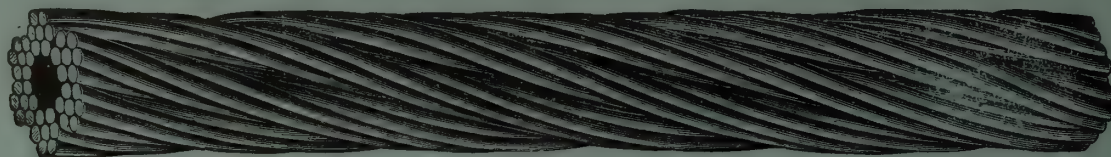
Geo. E. Drummond, Managing Director and Treasurer



# THE DOMINION WIRE ROPE CO. LIMITED

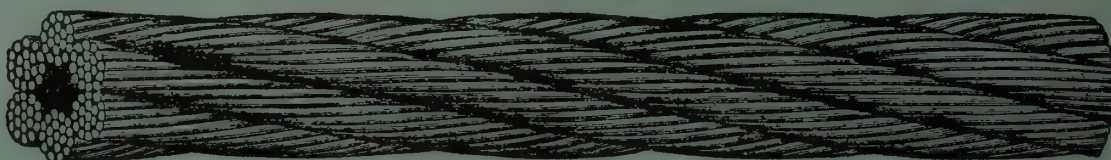
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**JAMES COOPER**

ORE  
AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS  
Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN  
STOCK...

CATALOGUE  
ON  
APPLICATION

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.



# The CANADIAN MINING REVIEW

Established 1882

Vol. XXII—No. XII.

OTTAWA, DECEMBER 31st, 1903.

Vol. XXII—No. XII.



**THE CANADIAN RAND DRILL CO.**  
SHERBROOKE, QUE.  
BRANCH OFFICES IN  
MONTREAL, QUE. TORONTO, ONT. HALIFAX, N.S.  
ROSSLAND, B.C. RAT PORTAGE, ONT. GREENWOOD, B.C.  
VANCOUVER, B.C.



ALL KINDS OF

## ..RUBBER GOODS FOR MINING PURPOSES..

Steam and Air Hose, Rubber Bumpers and Springs, Fire Hose,  
Pulley Covering, Rubber Clothing and Boots.

..MANUFACTURED BY..

THE GUTTA PERCHA & RUBBER MFG. CO. OF TORONTO, Limited



# LIDGERWOOD ENGINES

SPECIALLY BUILT TO MEET THE VARIOUS REQUIREMENTS  
IN MINES AND QUARRIES FOR

## HOISTING OR WINDING

AND ALSO IN THE EQUIPPING OF

### Locke-Miller System of Cableways

MANUFACTURED IN CANADA BY

## THE JAMES COOPER MANFG. CO. Limited

299 St. James Street, MONTREAL.

Branches—HALIFAX, 124 Hollis St.

RAT PORTAGE, c/o Diamond Drill Co.

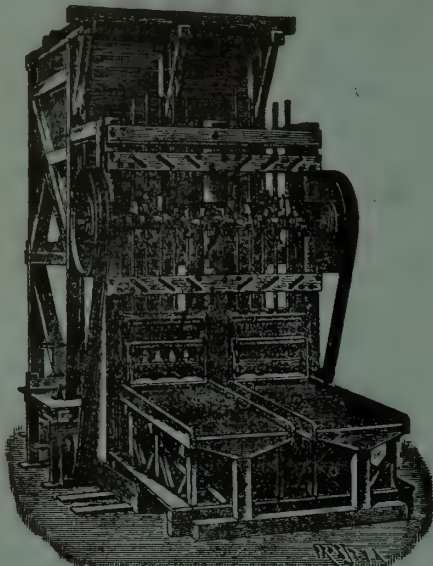
ROSSLAND, P.O. Building.



# FRIED. KRUPP AKTIENGESELLSCHAFT GRUSONWERK

Magdeburg-Buckau (Germany)

## MINING MACHINERY



### ORE CRUSHING:

Stone Breakers of specially strong construction, Roller Mills, Chilian Mills.

### BALL MILLS

for dry and wet crushing, more than 1,800 at work.

### STAMP BATTERIES

Shoes and Dies of Krupp's Special Steel.

### AMALGAMATION:

Amalgamation Tables and Pans, Larslo's Gold Amalgamators, Settlers, etc.

### SEPARATION and CONCENTRATION:

Separators, Exhaustors, Hydraulic Classifiers, Percussion Tables, Jiggers, Rotating Round Tables.

### LEACHING PLANT.

## Complete Gold Ore Dressing Plant

- For treating by the Wet Method with Stamp Batteries, Amalgamation and Concentration.
- For Dry Crushing by Ball Mills Dust Extraction, and Leaching.

## COAL WASHING PLANT

Large Testing Station for Crushing and Dressing Ores at the Works.

### Agents:

For Canada: JAS. W. PYKE & Co., Merchants Bank Building, MONTREAL.

For the United States: THOS. PROSSER & SON, 15 Gold Street, NEW YORK.

For Mexico: PABLO BERGNER, Apartado 540, MEXICO.

For South Africa: UNITED ENGINEERING CO., Ltd., P.O. Box 1082, JOHANNESBURG, S.A.R.

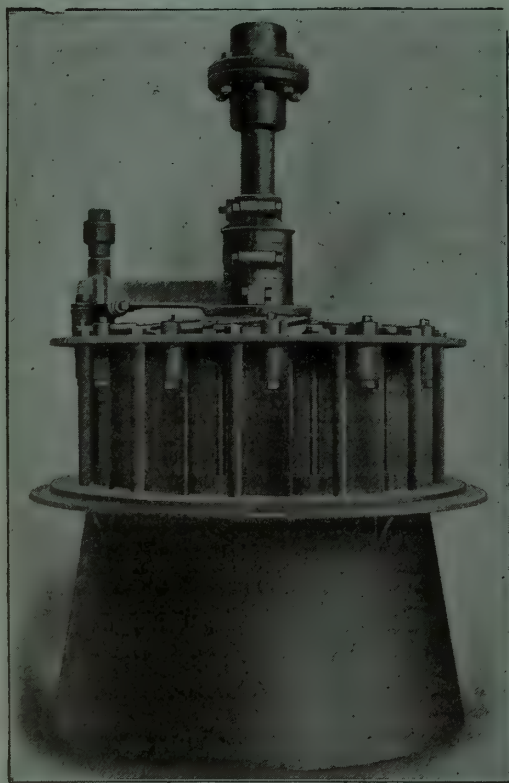
# RAILS

NEW AND SECOND HAND  
For Railways, Tramways, Etc.

JOHN J. CARTSHORE, 83 Front Street West

Opposite Queen's Hotel TORONTO, ONT.

## MINING EQUIPMENT, Etc.



## The Samson Turbine

Upright and Horizontal

Possesses in a greater degree than any other all the features that make a water wheel a success—SPEED, POWER, EFFICIENCY, DURABILITY and STRENGTH. Especially adapted to drive : : : : : : : : :

### Mining and Electric Power Plants

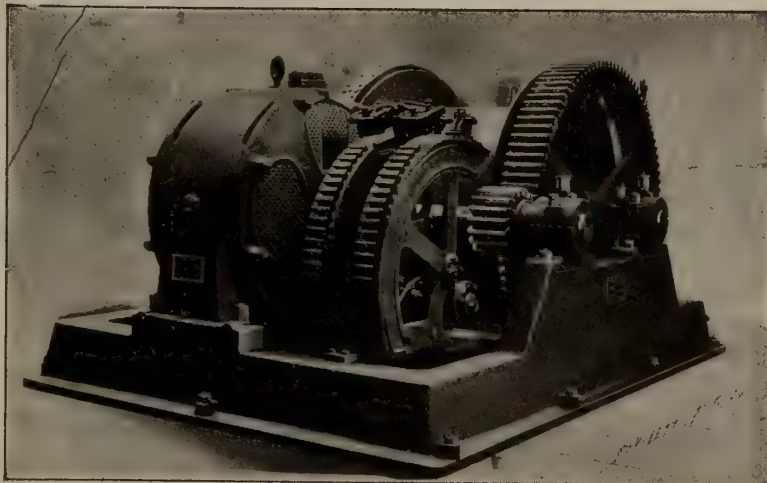
You cannot afford to overlook it : : : : :  
: : : : : Write us for full information

The Wm. Hamilton Mfg. Co. Ltd.

PETERBOROUGH, ONT.



# Westinghouse Induction Motors



Westinghouse Induction Motor Geared to Mine Hoist.

Their sparkless operation renders them particularly adapted for use in mines where inflammable gases are dangerous.

For particulars, address nearest office of

## Canadian Westinghouse Co. Limited.

Lawlor Bldg. King and Yonge Sts.  
Toronto.

Works: Hamilton, Ontario.

Liverpool and London & Globe Bld.  
Montreal.

HADFIELD'S  
PATENT



MANGANESE  
STEEL

Sole Representative of the Hadfield Steel Foundry Co., Ltd., Sheffield, for Canada

PEACOCK BROTHERS, Canada Life Building, MONTREAL.

## THOS. FIRTH & SONS, Ltd., Sheffield, Tool Steel and Rock Drill Steel

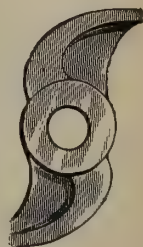
ALWAYS CARRIED IN STOCK.



SHOES AND DIES.



CAMS, TAPPETS, BOSSES, ROLL  
SHELLS, CRUSHER PLATES, &c.



## H. W. DeCOURTENAY & CO.

86 and 88 MCGILL STREET

Agents for Canada.

MONTREAL.



# ALLIS-CHALMERS CO.

SUCCESSOR TO

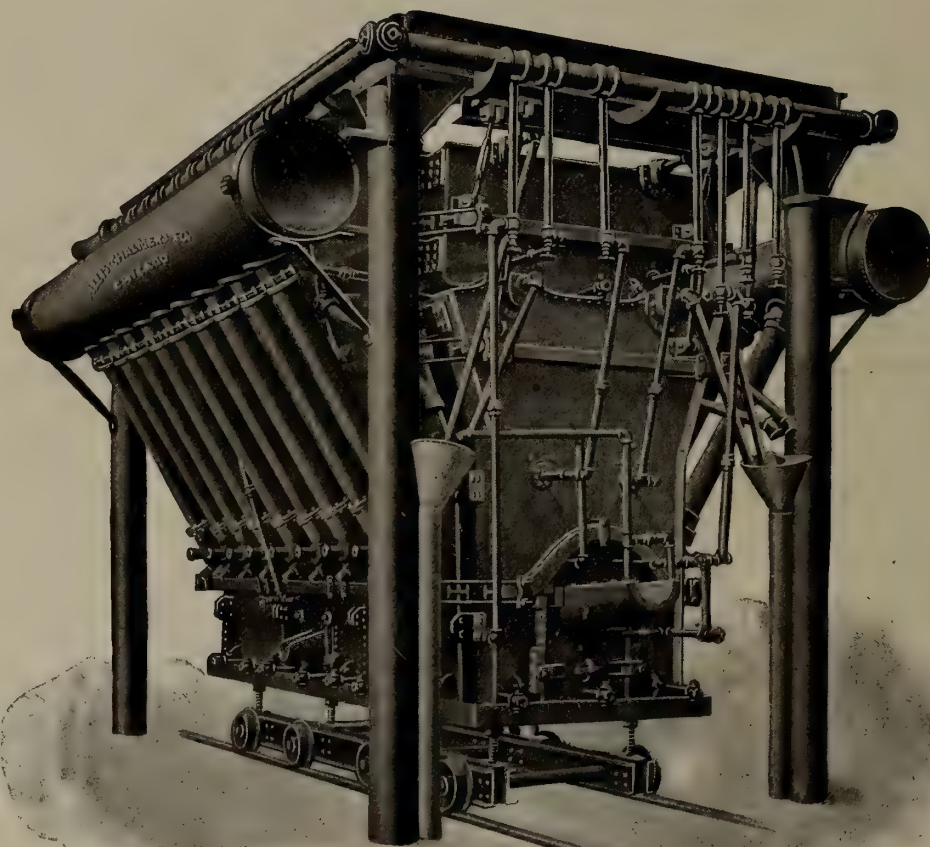
THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.

FRASER & CHALMERS,  
CHICAGO, ILL.

GATES IRON WORKS,  
CHICAGO, ILL.

DICKSON M'FG CO.,  
SCRANTON, PA.

## BUILDERS OF Mining and Smelting Machinery



DESIGNING and constructing water-jacketed blast furnaces for smelting lead and copper ores has been a most important and successful specialty of the Allis-Chalmers Company for a quarter of a century. We continuously improve our designs with the assistance of eminent smelters and metallurgists and this, in connection with diligent supervision and a splendid shop equipment, is the reason why the Allis-Chalmers Company is turning out furnaces of the highest standard only. They are furnished in all styles and sizes with jackets of flange steel or cast iron, also special jackets of all styles.

### BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

GENERAL OFFICE  
**CHICAGO, ILL., U.S.A.**

LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

### BRANCH OFFICES:

SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Hennen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway

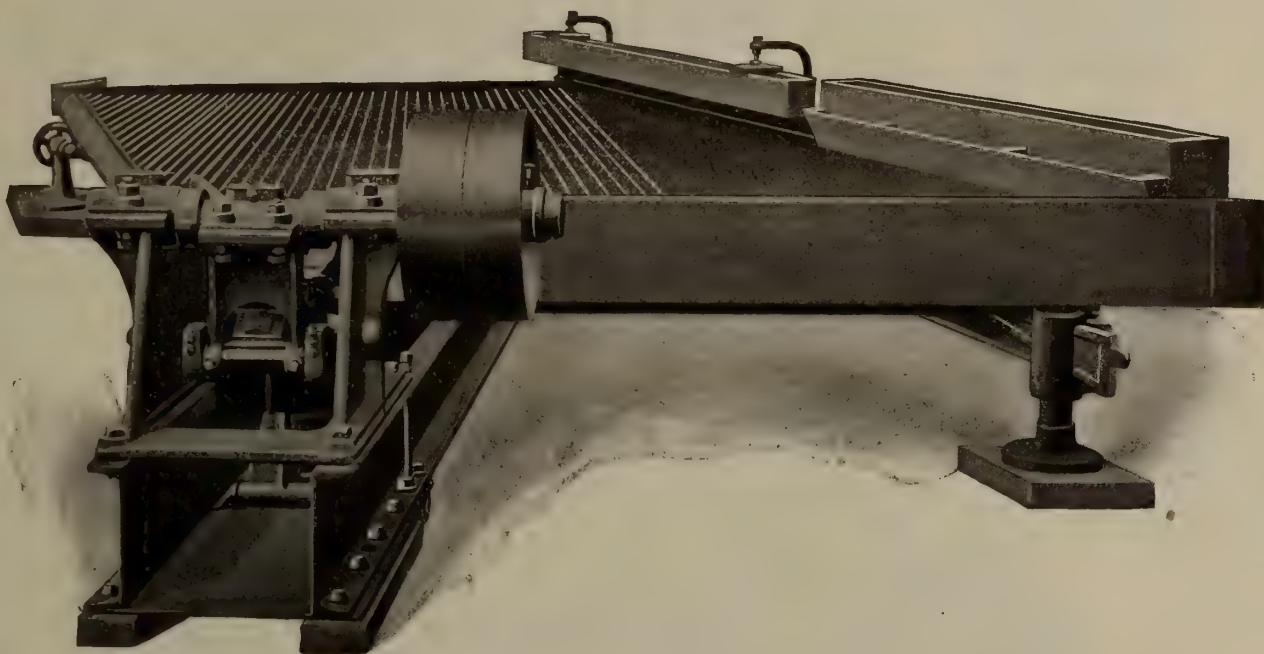


# ALLIS-CHALMERS CO.

SUCCESSOR TO

THE EDWARD P. ALLIS CO.,  
MILWAUKEE, WIS.FRASER & CHALMERS,  
CHICAGO, ILL.GATES IRON WORKS,  
CHICAGO, ILL.DICKSON M'FG. CO.,  
SCRANTON, PA.

SOLE BUILDERS OF  
THE No. 3, NEW DESIGN  
**OVERSTROM CONCENTRATOR**



We present herewith an illustration of our new No. 3, Overstrom Concentrator, which is built throughout of structural steel, with the exception of table top, feed and water boxes. We are producing a table that is

MECHANICALLY PERFECT  
NEW AND SUPERIOR DESIGN

DURABLE AND  
THE BEST CONCENTRATOR

The design is pronounced by experienced men as the best yet produced, having

THE BEST HEAD MOTION  
THE BEST TABLE CARRYING MECHANISM  
THE BEST TABLE ACTION

DIAGONAL IN FORM

DOUBLE TAPERED RIFFLES

Write for full particulars and prices.

New Catalogue will be sent upon application

## BRANCH OFFICES:

NEW YORK, Empire Bldg.  
BOSTON, Board of Trade Bldg.  
PITTSBURG, Frick Building  
MINNEAPOLIS, Corn Exchange Bldg.  
DENVER, 1649 Tremont Street  
SALT LAKE CITY, 209 S.W. Temple St.  
SPOKANE, Washington

GENERAL OFFICE  
**CHICAGO, ILL., U.S.A.**



LONDON, ENG., 533 Salisbury House

JOHANNESBURG, South Africa

## BRANCH OFFICES:

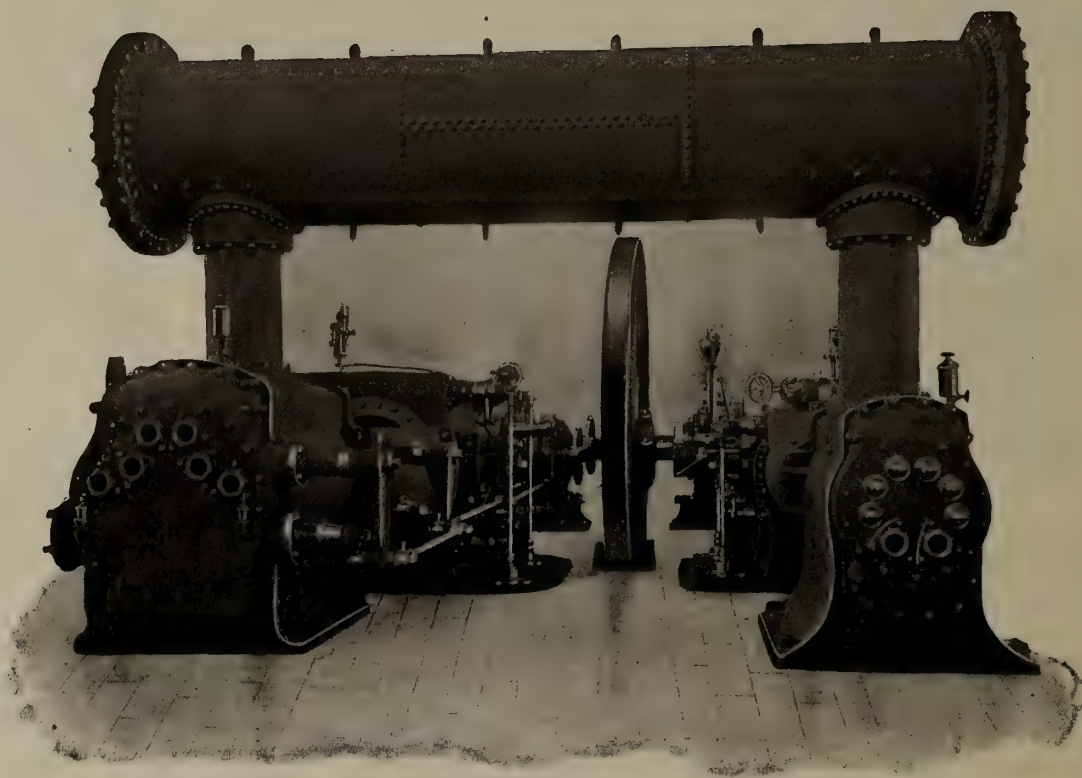
SAN FRANCISCO, Hayward Bldg.  
SEATTLE, Lumber Exchange Bldg.  
CHARLOTTE, N. C., Trust Bldg.  
NEW ORLEANS, Heinen Bldg.  
ATLANTA, GA., Equitable Bldg.  
BUTTE, MONT., 51 E. Broadway



# THE CANADIAN RAND DRILL CO

MANUFACTURERS OF

## AIR COMPRESSORS



**EASTERN BRANCHES**  
MONTREAL, QUE.  
TORONTO, ONT.  
HALIFAX, N.S.

**HEAD OFFICE & WORKS.**  
**SHERBROOKE,**  
QUEBEC.

**WESTERN BRANCHES**  
ROSSLAND, B.C.  
GREENWOOD, B.C.  
VANCOUVER, B.C.  
RAT PORTAGE, ONT.



# THE BENNETT FUSE



**The Popular Fuse Throughout the Dominion**

SOLE MANUFACTURERS

**WM. BENNETT SONS & Co.**

ROSKEAR SAFETY FUSE WORKS

**Camborne, Cornwall, England.**

AGENTS IN CANADA:

J. H. ASHDOWN, Winnipeg, Man.

MECHANICS SUPPLY CO., Quebec.

CAVERHILL, LEARMONT & CO., St. Peters St., Montreal.

WM. STAIRS, SON & MORROW, Halifax, N.S.

ROWLAND MACHIN, General Agent, Yates Street, Victoria, B.C.

## IMPROVED NEEDLE LUBRICATORS.

On a PATENT PNEUMATIC and SELF-ACTING PRINCIPLE,  
IN GLASS



### INSTRUCTIONS for FITTING and ADVANTAGES

The Lubricators being carefully fitted by enlarging the oil hole to fit the plug part of stopper, or otherwise by reducing the plugs to fit existing oil holes, the needle must be perfectly round, smooth and clean, so as to work freely in the tube, the flattened end reaching about half-way up the inside of Lubricator, while the other end rests on the shaft or axle, will produce the following results, viz. :—

- 1st.—Free working of the machinery by perfect lubrication.
- 2nd.—A saving of more than 75 per cent. in oil.
- 3rd.—Corresponding economy in steam-power and coals.
- 4th.—Cleanliness, and consequent saving in labor, engineers' stores, etc.

ALL OUR LUBRICATORS ARE FITTED WITH BRASS TUBES.

### IMPROVED STEAM TUBE CLEANER.



THE CLEANER THAT CLEANS CLEAN.

No Moisture.

No Scale.

Saves Cost Quickly.

WRITE FOR PRICES TO

**THE HAMILTON BRASS  
MFG. CO., Limited.**

**HAMILTON. ONT.**



# INGERSOLL-SERGEANT MACHINERY

Rock Drills  
Air Compressors  
Coal Cutters

The I-S COAL CUTTER

H 4



Is the most popular and extensively used  
COAL PUNCHER in NORTH AMERICA to-day.

It is easy on the operator, yet does the work. Light and strong.  
The economy of repairs is its recommendation with the superin-  
tendents, whilst economically it makes the most of every pound  
of pressure in the pipe line : : : : :

BUILT FOR USE IN CANADA  
BY

## THE JAMES COOPER M'F'G CO. Limited

299 ST. JAMES STREET

MONTREAL, Que.



# LARGEST VENTILATING FANS IN CANADA

ARE OF WALKER BROTHERS MANUFACTURE

## Intercolonial Coal Mining Co. Ltd.

18 FT. "INDESTRUCTIBLE" FAN, ROPE DRIVEN  
TWIN COMPOUND ENGINES 17" AND 27" DIA. BY 36" STROKE  
120000 cubic feet per minute, 4.5 inches water gauge  
Also COMPOUND HAULING ENGINES 16" AND 28" DIA. BY 24" STROKE.

## Acadia Coal Company

18 FT. "INDESTRUCTIBLE" FAN, ROPE DRIVEN  
TWIN COMPOUND ENGINES 15" AND 26" BY 30" STROKE  
120000 cubic feet per minute, 4.5 inches water gauge  
30 FT. FAN DIRECT DRIVEN  
24 FT. FAN DIRECT DRIVEN  
Also TWIN COMPOUND HAULING ENGINES 14" AND 23" BY 30" STROKE  
WINDING ENGINES 32" x 60" STROKE  
WINDING ENGINES 16" x 36" STROKE.

## Nova Scotia Steel and Coal Co. Ltd.

30 FT. FAN—10 FOOT WIDE  
DIRECT DRIVEN.

## Inverness Railway and Coal Co.

18 FT. "INDESTRUCTIBLE" FAN, ROPE DRIVEN  
TWIN COMPOUND ENGINES 14" AND 23" BY 30" STROKE  
250000 cubic feet per minute, 2 inch water gauge.

...MANUFACTURED BY...

# WALKER BROTHERS - WIGAN, ENGLAND

AIR COMPRESSORS, VENTILATING FANS,  
WINDING AND HAULING MACHINERY, Etc.

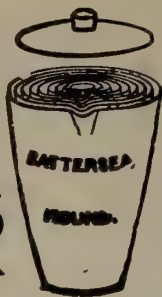
SOLE CANADIAN  
REPRESENTATIVES

## PEACOCK BROTHERS

CANADA LIFE BUILDING  
MONTREAL



# Chemical and Assay Apparatus



ZINC, CYANIDE and SULPHURIC ACID  
FOR CYANIDE PROCESS.

## COMPLETE ASSAY OUTFITS.

THE HAMILTON-MERRITT PROSPECTOR'S OUTFITS. ....

Becker's Balances and Weights.  
Battersea Crucibles and Muffles.  
Hoskins' Gasoline Furnaces.  
Kavalier's Bohemian Glassware.  
Munktel's Swedish Filters.

OUR 1897 CATALOGUE ON APPLICATION.

## Lyman, Sons & Company

380, 382, 384 and 386 St. PAUL STREET

**MONTREAL.**

LONDON

NEW YORK

PARIS

**J. BASZANGER & CO.**

108 FULTON ST., NEW YORK, N.Y., U. S. A.

IMPORTERS OF

**CARBONS** (BLACK DIAMONDS)  
AND BORTZ

For Diamond Drills and all Mechanical Purposes.



**Finest Quality and Shapes at Lowest Prices.**

Goods sent on Approval.

Worn out Carbons and Fragments bought.

# DIAMOND DRILLS

They remove solid cores through rock for prospecting.

They furnish the cheapest-known method of prospecting.

The capacity of our Drills is from 350 feet to 6000 feet.

SEND FOR OUR DIAMOND DRILL CATALOGUE.

## STANDARD DIAMOND DRILL CO.

431-3 STOCK EXCHANGE BUILDING, CHICAGO, U. S. A.



# NOVA SCOTIA STEEL & COAL CO. Ltd.

PROPRIETORS, MINERS AND  
SHIPPERS OF

## ..Sydney Mines Bituminous Coal..

Unexcelled Fuel for Steamships and Locomotives, Manufactories, Rolling Mills, Forges, Glass Works, Brick and Lime Burning, Coke, Gas Works, and for the Manufacture of Steel, Iron, Etc.

---

COLLIERIES AT SYDNEY MINES, CAPE BRETON.

---

MANUFACTURERS OF  
**HAMMERED AND ROLLED STEEL**  
FOR MINING PURPOSES

*Pit Rails, Tee Rails, Edge Rails, Fish Plates, Bevelled Steel Screen Bars, Forged Steel Stamper Shoes and Dies, Blued Machinery Steel  $\frac{3}{8}$ ' to  $\frac{1}{4}$ " Diameter, Steel Tub Axles Cut to Length, Crow Bar Steel, Wedge Steel, Hammer Steel, Pick Steel, Draw Bar Steel, Forging of all kinds, Bright Compressed Shafting  $\frac{5}{8}$ ' to 5" true to  $\frac{1}{1000}$  part of One Inch.*

---

A Full Stock of MILD FLAT, RIVET-ROUND and ANGLE STEELS Always on Hand.

Special Attention Paid to Miners' Requirements.

CORRESPONDENCE SOLICITED.

---

Steel Works and Head Office : NEW GLASGOW, N.S.



# JEFFREY Coal Cutting Hauling Drilling Screening Crushing Dredging Elevating Conveying Coal Washing Power Transmission MACHINERY



Electric and Compressed Air  
Chain Coal Cutters

Electric and Storage Battery  
Locomotives

Coal and Rock Drills

Generators

Mine Supplies

Mine Pumps and Fans, &c.

Rubber Belt Conveyors

Spiral Conveyors

Cable Conveyors

Screens      Crushers

Elevator Buckets

Boots and Bolts

Dump Cars

Chains—all styles

Sprocket Wheels

Coal Washers, &c.

We can elevate or convey your material—bulk or package, wet or dry,\* hot or cold — up, down, straight along, sidewise, any size, any distance.

## COAL CUTTERS

### ELECTRIC MINE LOCOMOTIVES

CATALOGUE No. 19 IS YOURS FOR  
—THE ASKING—



BEST ROCK DRILL IN THE  
MARKET



JEFFREY 16A ELECTRIC CHAIN COAL CUTTER.

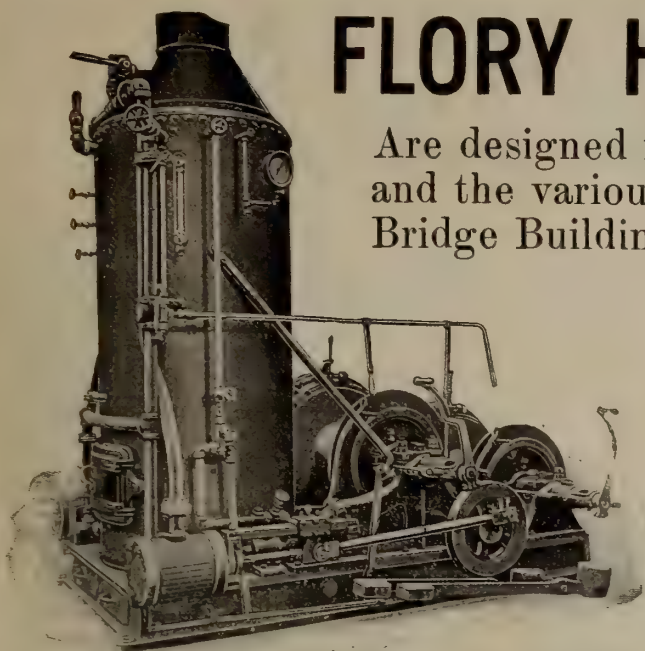
— ADDRESS —

## THE JEFFREY MFG. CO., Columbus, Ohio, U.S.A.

Montreal Representatives—WILLIAMS & WILSON

Toronto Representatives—A. R. WILLIAMS MACHINERY CO.





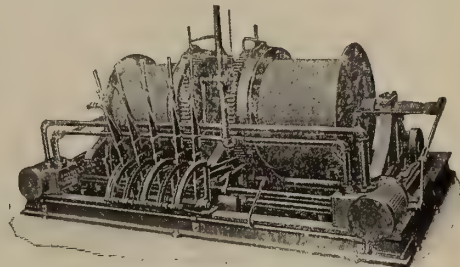
ASK FOR OUR CATALOGUES.

# FLORY HOISTING ENGINES STEAM AND ELECTRIC

Are designed for "STRENUOUS" duty. In Mines, Quarries, and the various requirements for Contractors: Pile Driving, Bridge Building and general Hoisting Purposes . . . . .

The **FLORY CABLEWAY**  
and **TRAMWAY SYSTEM**  
IS UNEQUALLED

**Slate Mining and  
Working Machinery**



SALES AGENTS—  
I. MATHESON & CO.,  
New Glasgow, N.S.  
W. H. C. MUSSEN & CO.,  
Montreal.

## S. Flory M'f'g. Co.

Office and Works: BANGOR, Pa., U.S.A.

If you wish to reach  
the best buyers of...

### Mining Machinery

In Canada

Advertise  
in  
the

## CANADIAN MINING REVIEW

### THE JOHN McDOUGALL

# Caledonian Iron Works Co. Limited

## MONTREAL, Que.

# BOILERS

## TANKS AND WROUGHT IRON WORK . . . . .

HYDRAULIC AND MILL MACHINERY

GEARS, PULLEYS, HANGERS

IRON CASTINGS OF EVERY DESCRIPTION

GENERAL AGENTS  
IN CANADA FOR

## WORTHINGTON PUMPS

Meters, Etc., Rife Hydraulic Engines and The New York  
Filter Manufacturing Company



# DRUMMOND COAL



COLLIERIES AT WESTVILLE, NOVA SCOTIA.

The Standard of Excellence  
in Bituminous Coal and Coke  
for Blast Furnaces, Foundries,  
Manufacturing and Domestic  
Use . . . . .

**RELIABLE, UNIFORM and STRICTLY HIGH GRADE**

Shipped from Pictou Harbour, Halifax, and all Points  
 on Intercolonial Railway and Connections by the

## Intercolonial Coal Mining Co. Limited

### AGENTS :

Hugh D. MacKenzie, Halifax.

Chas. W. Ives, Pictou.

Darrow, Mann & Co., Boston.

Arthur E. Scott, Quebec.

### Head Office : MONTREAL, Que.

JAS. P. CLEGHORN,  
 President.

CHARLES FERGIE,  
 Vice-Pres. & General Manager.

D. FORBES ANGUS,  
 Secretary-Treasurer.



# **..COAL..**

## **DOMINION COAL COMPANY, LIMITED**

Glace Bay, C.B. Canada

### MINERS OF

#### **BITUMINOUS COALS**

The celebrated "Reserve"  
coal for Household use.

#### **"INTERNATIONAL" GAS COAL**

And the best steam coal from its  
Collieries on the Phalen seam.

**Yearly Output 3,000,000 Tons.**



International Shipping Piers of the Dominion Coal Co. Limited, at Sydney, C.B.

Shipping facilities at Sydney and Louisburg, C.B., of most modern type. Steamers carrying 5,000 tons loaded in twenty-four hours. Special attention given to quick loading of sailing vessels. Small vessels loaded with quickest despatch.

### **Bunker Coal**

The Dominion Coal Company has provided unsurpassed facilities for bunkering ocean-going steamers with dispatch. Special attention given to prompt loading. Steamers of any size are bunkered without detention.

By improved screening appliances, lump coal for domestic trade is supplied, of superior quality.

APPLICATIONS FOR PRICES, TERMS, &c., SHOULD BE MADE TO

**ALEXANDER DICK, General Sales Agent, GLACE BAY, C.B.**

KINGMAN & CO., Agents, Custom House Square, Montreal, P.Q.

M. R. MORROW, Agent, 50 Bedford Row, Halifax, N.S.

R. P. & W. F. STARR, Agents, St. John, N.B.

HARVEY & CO., Agents, St. Johns, Nfld.



# DIAMOND

## DEEP DRILLING

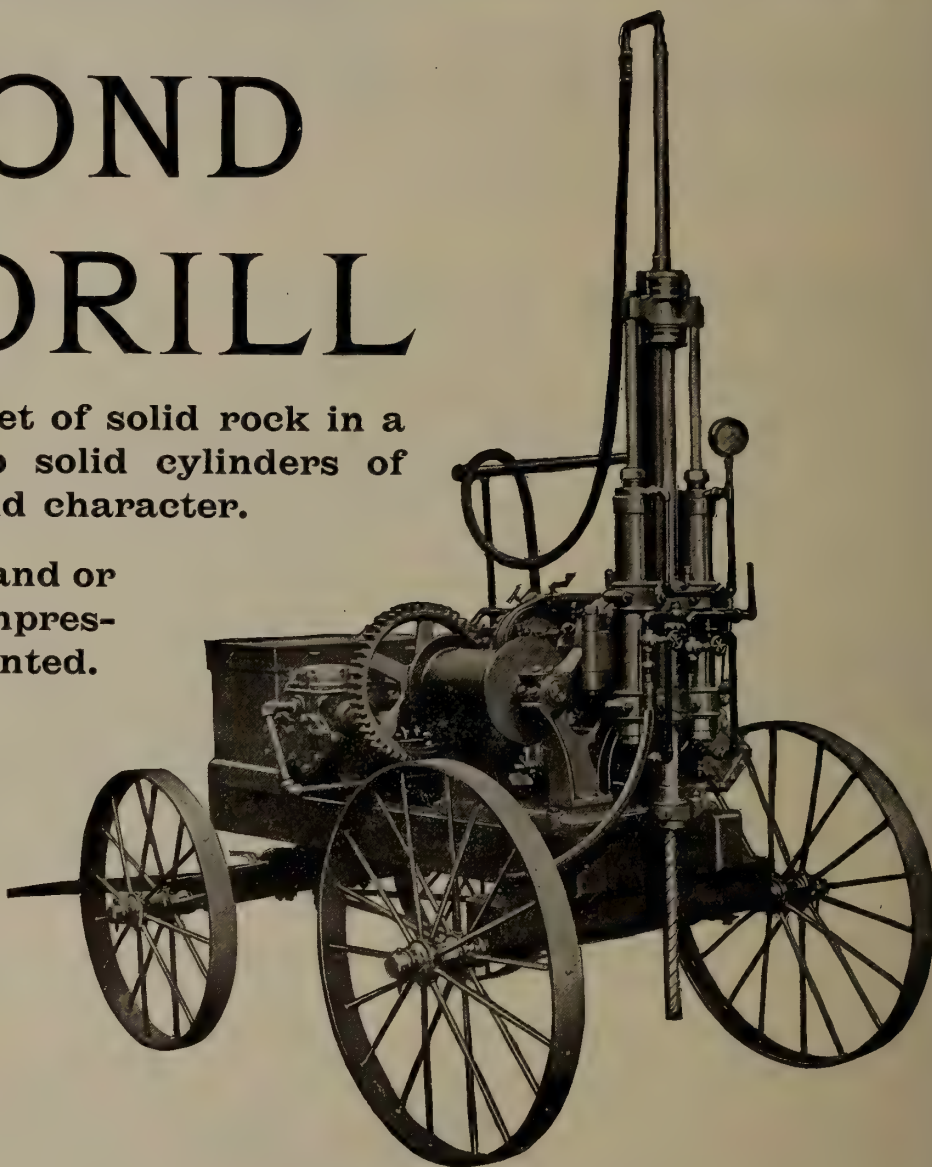
makes economical mining and the deepest hole can be drilled at the smallest cost by a

## DIAMOND ROCK DRILL

It can cut through 2,500 feet of solid rock in a vertical line. It brings up solid cylinders of rock, showing formation and character.

Made in all capacities, for Hand or Horse-power, Steam or Compressed Air—mounted or unmounted.

You will find lots of information in our new catalogue—may we send it?



American Diamond Rock Drill Co.

95 Liberty St., NEW YORK CITY, U.S.A.

Cable Address, "Occiduus," New York.

# ROCK DRILLS



# SULLIVAN MACHINERY CO.

Manufacturers of

## Rock Drills



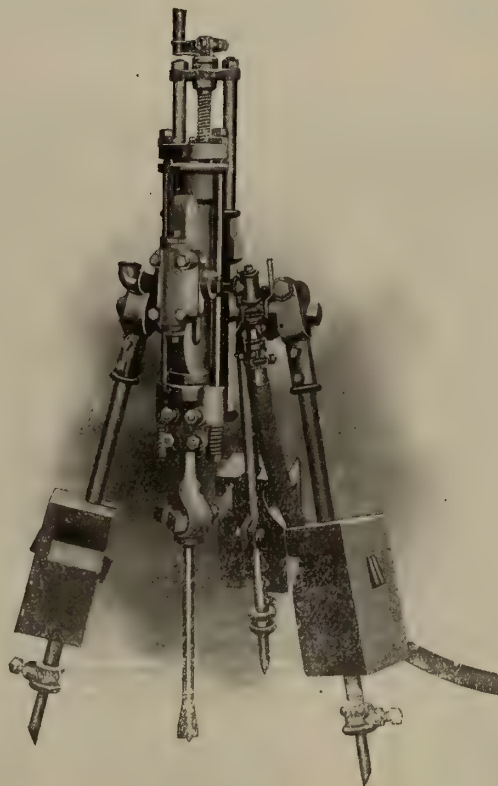
**The Great Lifting Power**  
of Sullivan Drills renders  
them efficient in soft or  
broken ground, as well  
as in the hardest rock

Sullivan 2 and 2½ in. Drills are  
unusually efficient for all light  
mining service.

With one of those drills, one  
man can put in more feet of  
holes than six men with hand  
hammers.

—WE ALSO BUILD—

**Air Compressors  
Hoisting Engines  
Diamond Drills  
Coal Mining and  
Quarrying Machinery**



CLAREMONT, NH.  
NEW YORK  
PITTSBURG

135 ADAMS ST.,  
CHICAGO, U.S.A.  
EUROPEAN AGENTS 25 RUE RAFFET PARIS.

ST. LOUIS  
DENVER  
EL PASO



# Electric Blasting Apparatus.



MANUFACTURED  
ONLY BY

Adapted for Firing all kinds of Explosives used in Blasting.

**Victor Electric Platinum Fuses.**

Superior to all others for exploding any make of dynamite or blasting powder. Each Fuse folded separately and packed in neat paper boxes of 50 each. All tested and warranted. Single and double strength with any length of wires.

**Blasting Machines.**

The strongest and most powerful machines ever made for Electric Blasting. They are especially adapted for submarine blasting, large railroad quarrying, and mining works.

**Victor Blasting Machine.**

Fires 5 to 8 holes; weighs 15 lbs., adapted for prospecting, etc.

**Insulated Wires and Tapes,**

**Blasting Caps, Fuse, Etc.**



SEND FOR  
CATALOGUE

**JAMES MACBETH & CO., 128 Maiden Lane, New York, U.S.A.**

## Hamilton Powder Company

### Manufacturers of Explosives

Office: 4 Hospital Street, Montreal.

Branch Offices throughout Canada.

For  
Miners  
Pit Sinkers

## DYNAMITE AND EXPLOSIVES

For  
Quarrymen  
Contractors

... Manufacturers and Dealers in ...

## ELECTRIC BLASTING APPARATUS, FUSE, CAPS, &c.

DAN'L SMITH,  
President.  
C. A. MACPHERSON,  
Sec.-Treas.

**ONTARIO POWDER CO. Limited**

115 BROCK STREET

**Kingston, Ont.**

## Iron and Steel Structures for Collieries, Metal Mines and Smelting Works. . . .

Steel Bridges for Railways and Highways. Steel Piers and Trestles. Steel Water Towers and Tanks. Steel Roofs, Girders, Beams, Columns, for Buildings. . . .

A LARGE STOCK OF

**ROLLED STEEL BEAMS, JOISTS, GIRDERS, CHANNELS, ANGLES, TEES, Z BARS AND PLATES**

ALWAYS ON HAND, IN LENGTHS TO THIRTY-FIVE FEET

Tables, giving Sizes and Strength of Rolled Beams, on application.

Post Office Address, - MONTREAL.

**Dominion Bridge Co., Ltd.,** Montreal and  
Lachine Locks, P.Q.

# MILL AND MINING MACHINERY

Shafting, Pulleys, Gearing, Hangers, Boilers, Engines, Steam  
Pumps, Chilled Car Wheels and Car Castings. Brass and Iron  
Castings of Every Description. Light and Heavy Forgings.

**ALEX. FLECK** Vulcan Iron **OTTAWA**  
..Works..







OFFICERS  
CANADIAN MINING  
1903



E.B. KIRBY.



S.F. PARRISH.



FREDERIC KEFFER.



J.H. TONKIN.

BRITISH  
COLUMBIA



S.S. FOWLER. PAST PRES.



E.A. SJOSTEDT.



A.P. TURNER.



B.T.A. BELL. SECY



D.G. KERR.

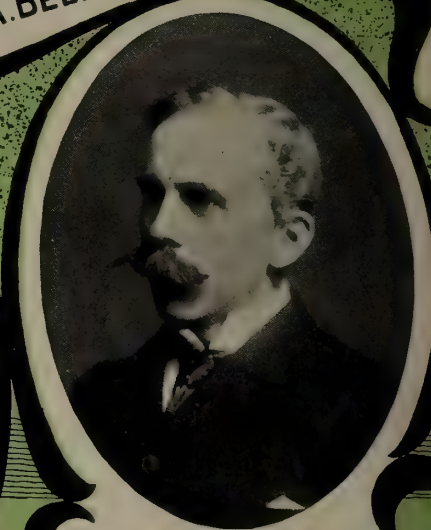


DR. W.L. GOODWIN.

ONTARIO



J.B. HOBSON. VICE PRES.



DR. F.D. ADAMS. VICE PRES.

Incorporated by Act of





# COUNCIL ING INSTITUTE 1904



C. FERGIE PAST PRES.



J. STEVENSON BROWN, TREAS.



R. E. CHAMBERS VICE PRES



G. R. SMITH, VICE PRES.



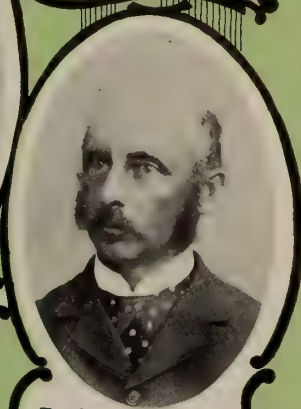
C. SHIELDS.



G. H. DUGGAN.



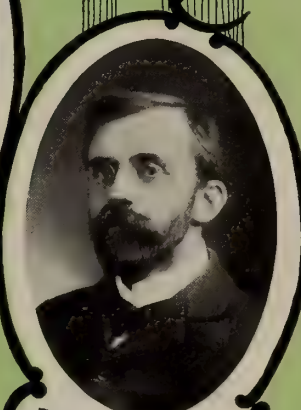
THOS. CANTLEY.



DR. E. GILPIN JR.



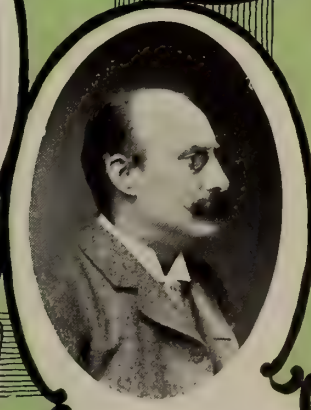
H. J. WILLIAMS.



DR. J. B. PORTER.



B. BENNETT.



F. CIRKEL.







# QUICK DELIVERY OF BOILERS

We have in stock material for the following sizes and styles of boilers :—

|                  |   |   |   |   |                |
|------------------|---|---|---|---|----------------|
| Mumford Standard | - | - | - | - | 35 to 175 H.P. |
| Mumford Portable | - | - | - | - | 6 to 110 "     |
| Return Tubular   | - | - | - | - | 12 to 150 "    |
| Vertical         | - | - | - | - | 4 to 60 "      |

As we have a large shop, thoroughly equipped with the latest appliances, we can deliver any of the above boilers on short notice.

Competent persons tell us that the quality of our boiler work cannot be surpassed.

**Robb Engineering Co. Limited**  
**Amherst, N.S.**

**AGENTS** } WILLIAM MCKAY, 320 Ossington Avenue, Toronto.  
WATSON JACK & COMPANY, 7 St. Helen Street, Montreal.  
J. F. PORTER, 355 Carlton St., Winnipeg.



# THE Canadian Pacific Railway

IS THE MOST DIRECT ROUTE  
TO THE

## Great Mining Regions

OF

## British Columbia, the Yukon and Alaska.

DAILY  
SERVICE  
BETWEEN  
—THE—

ATLANTIC  
—AND—  
PACIFIC  
COAST

THROUGHOUT  
THE YEAR

First-class Sleeping and Dining Cars attached to all through trains.

Quickest route to the Yukon via the C. P. R. to Vancouver, C. P. N. steamships to Skagway and White Pass Railway and connecting steamers to Dawson.

Magnificent fleet of steamers in the inland waters of Southern British Columbia by which all important points, not connected by rail, can be reached.

For rates, reservation of berths, etc., apply to nearest C. P. R. Agent or to

**C. E. E. USHER,**  
General Passenger Agent,  
Eastern Lines,  
MONTREAL.

**C. E. McPHERSON,**  
General Passenger Agent,  
Western Lines,  
WINNIPEG, Man.

**ROBERT KERR,**  
Passenger Traffic Manager,  
MONTREAL.

# SCHOOL of MINING

Practical Science Faculty of  
Queen's University

Kingston, Ontario.

## THE FOLLOWING COURSES ARE OFFERED

1. THREE YEARS' COURSE FOR A DIPLOMA IN
  - (a) Mining Engineering.
  - (b) Analytical Chemistry and Assaying.
2. FOUR YEARS' COURSE FOR A DEGREE B.Sc. IN
  - GROUP I.
    - (a) Mining Engineering.
    - (b) Chemistry and Mineralogy.
    - (c) Mineralogy and Geology.
    - (d) Chemical Engineering.
  - GROUP II.
    - (e) Civil Engineering.
    - (f) Mechanical Engineering.
    - (g) Electrical Engineering.
  - GROUP III.
    - (h) Biology and Public Health.
3. COURSES IN CHEMISTRY, MINERALOGY AND GEOLOGY  
for degrees of Bachelor of Arts (B.A.) and Master of Arts (M.A.)

For further information see the Calendar of Queen's University.

4. POST-GRADUATE COURSE FOR THE DEGREE OF  
Doctor of Science (D.Sc.)

For further information see the Calendar of Queen's University.

Next Session begins  
Sept. 30th, 1903.

MATRICULATION EXAMINATIONS HELD AT QUEEN'S UNIVERSITY  
SEPTEMBER 16TH.

THE SCHOOL is provided with well equipped laboratories for the study of Chemical Analysis, Assaying, Blowpiping, Mineralogy, Petrography and Drawing. It has also a well equipped Mechanical Laboratory. The Engineering Building will be ready for occupation next session and the Geology and Physics Building the following session. The Mining Laboratory has been remodelled at a cost of some \$12,000 and the operations of crushing, amalgamating, concentrating, chlorinating, cyaniding, etc., can be studied on a large scale.

For Calendar of the School and  
further information, apply to

The Secretary, School of Mining, Kingston, Ont.



# POWER STEEL ROPE

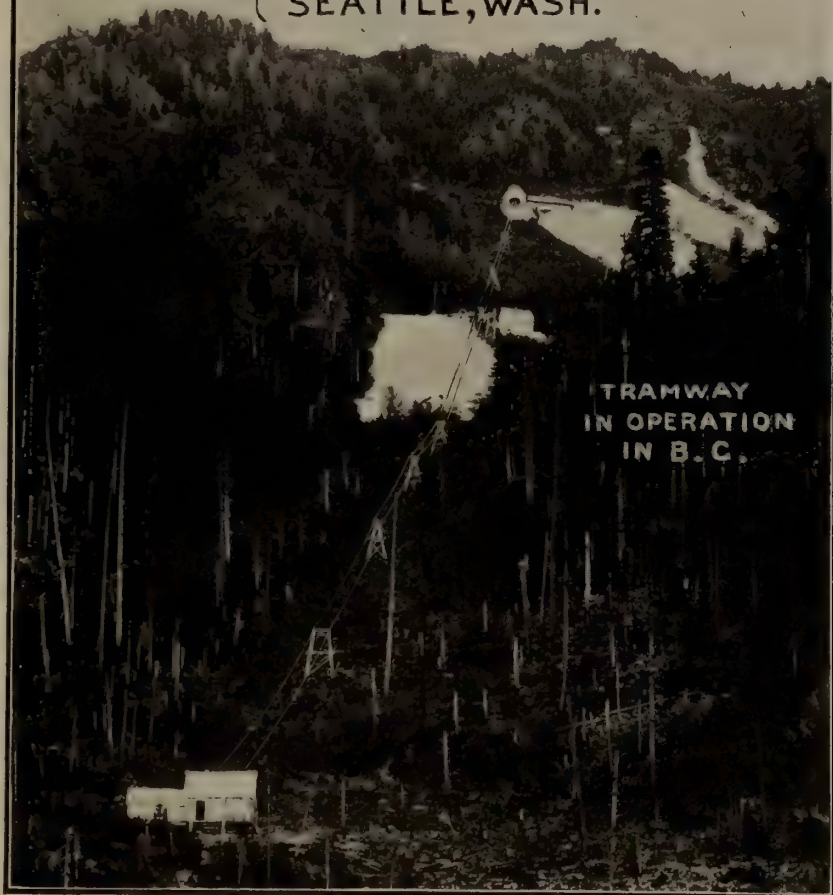
...THE MOST POWERFUL ROPE MADE...

"It Wears Well because it's Made Well"

**BRODERICK & BASCOM ROPE CO**  
ST. LOUIS, U.S.A.

MANUFACTURERS OF  
**WIRE ROPE & AERIAL TRAMWAYS**

BRANCH OFFICES { NEW YORK 33 SOUTH ST.  
PORTLAND, ORE.  
SEATTLE, WASH.



A California logger says, "Your POWER ROPE is far ahead of any we have ever used, is now in use 10 months and will last several more. Has handled more logs per month over a worse road than any of our previous ropes. Have never obtained over two or three months' service from other makes."

A Washington logger writes, "I desire to say that your POWER WIRE ROPE is the best I have ever used. Have given it the roughest kind of usage, not only for yarding purposes, but for building roads as well and notwithstanding the rough usage, there is not a single broken wire in the rope."





# THE BUCKEYE LIGHT

Will generate 5000 C.P. from common kerosene, requiring no attention.  
The Buckeye Light is complete in itself, can be moved with the work, and

**IS SPECIALLY ADAPTED FOR MINE USE**

**W. H. C. MUSSEN & CO. MONTREAL, P.Q.**

"NOT AN EXPERIMENT: IN GENERAL USE THROUGHOUT THE WORLD"

## The New Jackson Hand Power Rock Drill

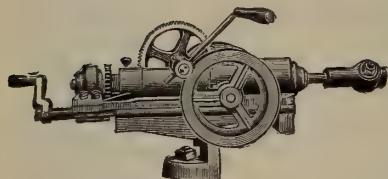
Handled and operated by ONE MAN, will accomplish work of THREE MEN drilling with Bits and Hammers.

**WILL WORK IN ANY POSITION, IN ANY ROCK.**

It Saves Steel,

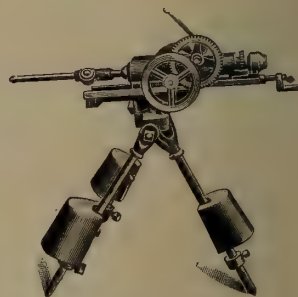
It Saves Labor,

It Saves Money.



Write for Catalogue.

**JOHNSON WILLATS & CO. Sales Agent, 192 King St. West, Toronto, Ont.**



## School of Practical Science, Toronto

ESTABLISHED 1878.

AFFILIATED TO THE UNIVERSITY OF TORONTO.



This School is equipped and supported entirely by the Province of Ontario and gives instruction in the following departments:

- 1—CIVIL ENGINEERING
- 2—MINING ENGINEERING
- 3—MECHANICAL & ELECTRICAL ENGINEERING
- 4—ARCHITECTURE
- 5—ANALYTICAL AND APPLIED CHEMISTRY

Special Attention is directed to the Facilities possessed by the School for giving Instruction in Mining Engineering. Practical Instruction is given in Drawing and Surveying, and in the following Laboratories:

- |            |                |              |
|------------|----------------|--------------|
| 1—CHEMICAL | 3—MILLING      | 6—ELECTRICAL |
| 2—ASSAYING | 4—STEAM        | 7—TESTING    |
|            | 5—METROLOGICAL |              |

The School also has good collections of Minerals, Rocks and Fossils. Special Students will be received as well as those taking regular courses.

FOR FULL INFORMATION SEE CALENDAR.

L. B. STEWART, Secretary.

## THE BUCYRUS COMPANY

SOUTH MILWAUKEE, WISCONSIN.

## STEAM SHOVELS AND DREDGES.

PLACER MINING MACHINERY OF THE ELEVATOR BUCKET TYPE.

RAILROAD WRECKING CARS AND PILE DRIVERS.

CENTRIFUGAL DREDGING PUMPS.



# PUMPING MACHINERY

FOR  
**WATERWORKS  
 and MINES**

**OFFICIAL TRIAL**  
 LEEDS WATERWORKS

Steam per Pump  
 Horse Power per Hour

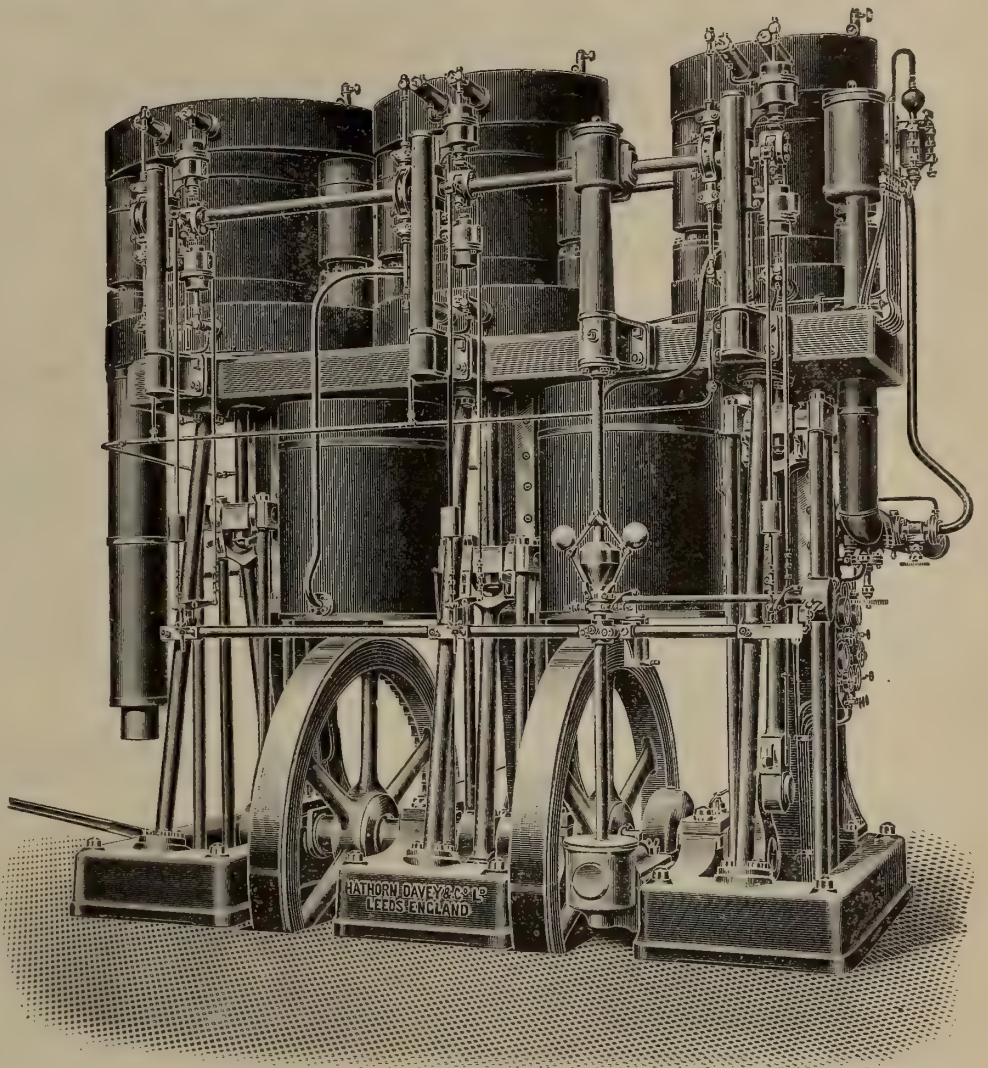
**13.051 lbs.**

Steam per Indicated  
 Horse Power per Hour

**11.91 lbs.**

**Mechanical  
 Efficiency**

**91 per cent.**



**HATHORN DAVEY & Co. Ltd.** LEEDS ENGLAND

Sole Canadian  
 Representatives

**PEACOCK BROTHERS**

Canada Life Building  
 MONTREAL

## The Canadian Mining Manual

This standard work of reference to Canadian Mining undertakings and active industries is NOW READY. A complete mining directory. New features. Arranged alphabetically, classified by industries and by Provinces

For the

MINE MANAGER,  
 THE CAPITALIST and  
 THE MANUFACTURER.

Bound in Cloth.

Price Four Dollars.

THIRTEENTH  
 YEAR

**1903**

THIRTEENTH  
 YEAR

BY

**B. T. A. BELL**

EDITOR CANADIAN MINING REVIEW

SECRETARY CANADIAN MINING INSTITUTE.

Published  
 by

**THE CANADIAN MINING REVIEW**

OTTAWA,  
 Canada



## HENRY BATH & SON,

London, Liverpool and Swansea,  
**BROKERS.**

All Description of  
Metals, Mattes, Etc.  
Warehouses, Liverpool and Swansea.  
Warrants Issued under their Special Act of  
Parliament.

### NITRATE OF SODA.

Cable Address: - BATHOTA, LONDON.

## SADLER & HAWORTH

TANNERS AND  
MANUFACTURERS OF

Oak Leather Belting . . . . .  
Hydraulic and Mechanical Leather

MONTREAL and  
TORONTO.

## KING BROTHERS

15 Bell's Lane  
QUEBEC.

## Lumber Asbestos Chromic Iron

Mills at River Ouelle, Lyster, Kingsburg,  
Pabos, Cedar Hall.

ASBESTOS—Crude, Fibreized and Paper  
Stock Hampden Mine, Thetford.

CHROMIC IRON MINE—Black Lake.

### L. VOGELSTEIN

90-96 WALL STREET, NEW YORK

REPRESENTING

ARON HIRSCH & SOHN  
Halberstadt, Germany

Copper, Argentiferous and Auriferous Copper Ores,  
Mattes and Bullion, Lead, Tin, Antimony, Spelter.  
Copper and Brass Rolling and Tubing Mills in Europe.

AGENTS OF THE  
DELAMAR COPPER REFINING WORKS  
Carteret, N.J.

### IN PRESS

13th EDITION

Canadian Mining Manual and  
Mining Companies Year Book

1903

## NICKEL

The  
Canadian Copper  
Company

43 EXCHANGE PLACE  
NEW YORK

## NICKEL FOR NICKEL STEEL

The Orford Copper Company

43 EXCHANGE PLACE  
NEW YORK

### LICENSES TO PROSPECT

or work Minerals on any of their Lands and Reservations covering nearly a quarter of a million acres in Eastern Ontario, and principally within the belts containing Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marble, Building Stone, and other valuable minerals, are issued by

### The Canada Company

For list of lands and terms apply to the Company's  
Mining Inspector and Agent

ANDREW BELL, C.E., D.L.S., Etc  
ALMONTE, ONT.

### OLDEST EXPERTS IN

Molybdenite,  
Scheelite,  
Wolframite,  
Chrome Ore,  
Nickel Ore,  
Cobalt Ore,  
Cerium, and  
all Ores  
and Minerals  
Talc,  
Mica,  
Barytes,  
Graphite,  
Blende,  
Corundum,  
Fluorspar,  
Feldspar.

LARGEST BUYERS. BEST FIGURES.  
ADVANCES ON SHIPMENTS.  
CORRESPONDENCE SOLICITED.

CHARLES—Blackwell, Liverpool, ABC Code, Moreing  
& Neal, Mining and General Code, Liebers  
Code and Mullers Code.

ESTABLISHED 1869.

## LEDOUX & Co.

99 JOHN ST., NEW YORK.

### Sample and Assay Ores and Metals.

Independent Ore  
Sampling Works  
at the Port of  
New York. Only  
two such on the  
Atlantic seaboard

We are not Dealers or Refiners, but Receive  
Consignments, Weigh, Sample and Assay them,  
selling to highest bidders, obtaining advances when  
desired, and the buyers of two continents pay the  
highest market price, in New York Funds, cash  
against our certificates.

**MINES EXAMINED AND SAMPLED.  
ALSO ANALYZE EVERYTHING.**

### McPherson, Clark, Campbell & Jarvis

Barristers, Solicitors, &c.

OFFICES:

Trusts and Guarantee Building  
16 King St. West, Toronto, Can

Cable Address: CLAPHER, TORONTO.

### FRITZ CIRKEL

CONSULTING MINING ENGINEER

Dip. Graduate Royal Technical Academy, Aachen,  
Germany.

Eighteen years' experience in Exploratory  
Work and Mining in Germany, Belgium,  
Eastern and Central Canada, British Colum-  
bia and the Pacific States.

EXAMINATION OF MINES.

Reports in English, French and German.

Office, 80 STANLEY ST. MONTREAL, CAN.

### PARMALEE & WELD

Successors to Pohle & Parmelee

**ANALYTICAL CHEMISTS and ASSAYERS.**

Special Attention to Control and Umpire Work  
Ores tested to determine the best method of treatment.  
Experimental work on chemical processes or patents.  
General Commercial analysis.

Prices and sample sacks free on application.

P.O. Box 1421. 1755 Arapahoe St. Denver, Colo.

### E. J. WALSH

CIVIL AND CONSULTING ENGINEER

M. Can. Soc. C.E. and

M. Can. Mining Institute.

OTTAWA - CANADA.

### S. DILLON-MILLS

MINING EXPERT

Address all correspondence to  
538, Huron Street TORONTO.

Specialty:

Examination, Prospecting and Initial  
Development of Mining Properties.



# DIRECTORY OF MINING ENGINEERS, CHEMISTS, ASSAYERS, ETC.

**JOHN E. HARDMAN, S.B.**CONSULTING  
MINING ENGINEER

Room 2, Windsor Hotel Montreal.

20 years' experience in the Mining and Reduction of  
Gold, Silver, Lead and Copper.

13 years as a Specialist in Gold Mining and Milling.

**JOHN B. HOBSON**

CONSULTING MINING ENGINEER

Manager Con. Cariboo Hyd. Mining Co., Limited

BULLION, BRITISH COLUMBIA.

28 years' experience in the equipment and operation  
of large Hydraulic, Deep Gravel, Drift and Gold  
Quartz Mines, in California and British Columbia.

Telegraphic and Cable Address:

"HOBSON," ASCHROFT, B.C.

**J. B. TYRRELL**

Late of the Geological Survey of Canada.

MINING ENGINEER

DAWSON - - - YUKON.

Telegraphic Address—Tyrrell, Dawson.

Code used—Bedford McNeil's.

**MILTON L. HERSEY, M.Sc.** (McGill)  
CONSULTING CHEMIST OF THE C. P. R.

OFFICIAL ASSAYER APPOINTED FOR PROV. OF QUEBEC.

146 St. James Street MONTREAL

ASSAYS OF ORES.

CHEMICAL AND PHYSICAL TESTS OF ALL  
MATERIALS.

MINERAL PROPERTIES EXAMINED.

**J. BURLEY SMITH**

CIVIL AND MINING ENGINEER

30 Years Experience.

RAT PORTAGE - - - ONTARIO.

Undertakes the Prospecting of Mines and Mineral Lands.

Diamond Drill Borings made by contract for all minerals  
(earthy and metalliferous), Artesian Wells and Oil Springs,  
also Deep Soundings for Harbors, Rivers, Canals, Tunnels and  
Bridge Foundations. Quarry Sites and Clay Fields tested.Plans and Sections made showing result of Borings—Gold  
Drifts tested to Ledge by the new Pneumatic and Hydraulic  
Tube System and the yield ascertained—Flumes, Ditches,  
Monitors and Placer Mining Plant generally designed and con-  
structed. Properties Examined and Reported on, Assays made.**F. HILLE**

MINING ENGINEER.

Mines and Mineral Lands examined and re-  
ported on. Plans and Estimates on Concen-  
trating Mills after the Krupp-Bilharz system.

PORT ARTHUR, ONT.

CANADA.

**J. T. DONALD**

ASSAYER AND MINING GEOLOGIST.

112 St. Francois-Xavier St.,  
MONTREAL.Analyses and Assays of Ores, Fuels, Furnace  
Products, Waters, etc. Mines and Mining Pro-  
perties examined and valued.**FRANK B. SMITH, B.Sc.**CIVIL AND  
MINING ENGINEERCertificated Colliery Manager Great Britain and  
British Columbia.

REPORTS ON MINING PROPERTIES.

CALGARY, ALTA.

**FRANK C. LORING**MINING  
ENGINEER

No. 45 Broadway NEW YORK

Office, Room 83.

**JOHN ASHWORTH**

CONSULTING MINING ENGINEER

Of the firm of

**ASHWORTH & MORRIS**Civil and Mining  
Engineers.Surveyors and  
Valuers.

8-KING STREET-8

MANCHESTER, ENGLAND

**J. H. CHEWETT, B.A. Sc.**

(Honor Graduate in Applied Science, Toronto University)

Asso. Mem. Can. Soc. C.E.

MINING ENGINEER

Consultation. Reports. Development.

87 YORK ST., ROSSIN BLOCK,  
TORONTO.**CHAS. BRENT**

MINING ENGINEER AND METALLURGIST

Rat Portage, Ont.

Examines and reports on Mining Properties.  
Superintends the erection of Mining and Milling  
Plants.**J. C. GWILLIM, B.Sc.**MINING  
ENGINEER

KINGSTON - B.C.

**JOHN McAREE, B.A. Sc.**MINING  
ENGINEER

Ontario and Dominion Land Surveyor.

RAT PORTAGE - - - ONTARIO.

**DeMOREST & SILVESTER**CIVIL AND MINING ENGINEERS.  
ONTARIO LAND SURVEYORS.

Surveys. Reports. Development. Installation.

Cable address, "DEMORSIL, SUDBURY."  
Codes, Lieber's and Bedford McNeil's.

SUDBURY, ONTARIO.

**WM. BLAKEMORE**

MINING ENGINEER.

Consultation. Reports. Development.

Montreal.

**A. W. ROBINSON, M. Am. Soc. C.E., M. Am. Soc. M.E.**

MECHANICAL ENGINEER

DREDGING MACHINERY.

PLANT FOR PUBLIC WORKS.

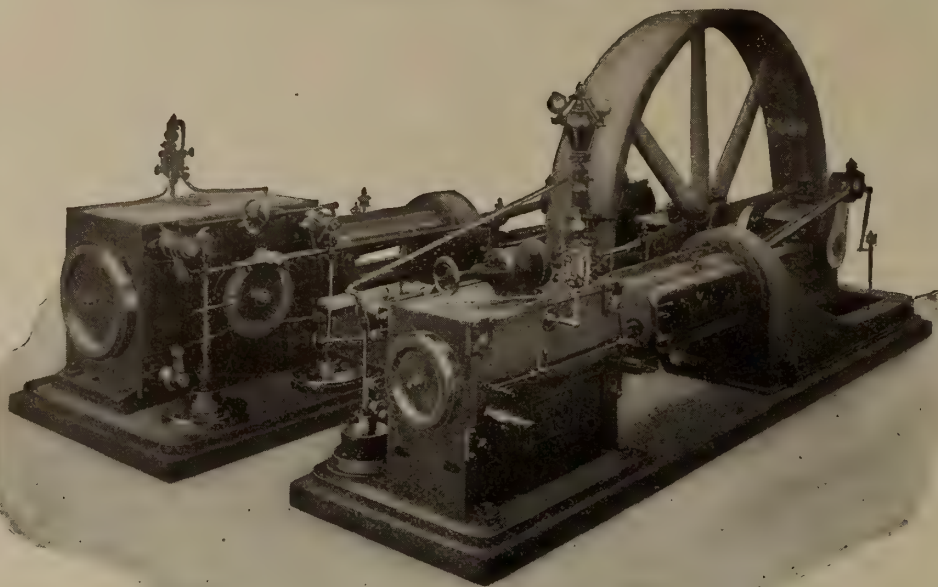
GOLD DREDGES.

14 PHILLIPS SQ., MONTREAL

CANADA.



## CORLISS ENGINES



Jenckes-Corliss Cross Compound Engine

Built in all sizes, Simple and Compound.

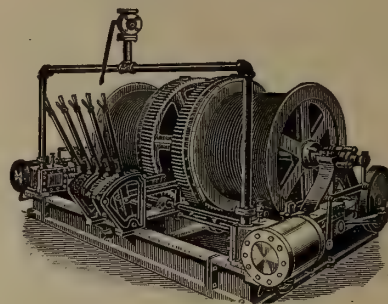
Description and prices on request.

**The Jenckes Machine Company**

727 Lansdowne Street, Sherbrooke, Quebec.

## M. BEATTY & SONS

Welland, Ontario.



MANUFACTURERS OF

Dredges, Ditchers, Derricks and Steam Shovels  
for Dredging, Dykeing, Ditching, GOLD  
MINING, Etc., of various Styles and  
Sizes to Suit any Work.

MINE HOISTS, HOISTING ENGINES  
HORSE POWER HOISTERS,  
SUSPENSION CABLEWAYS,  
STONE DERRICKS, GANG STONE SAWS.  
Submarine Rock Drilling Machinery.

Centrifugal Pumps for Drainage Works,  
Pumping Sand, Gold Mining,  
Contractor's Use, &c.

WIRE ROPE AT MARKET PRICES.

AGENTS:

**E. LEONARD & SONS**

MONTREAL, QUE.

ST. JOHN, N.B.

**THE B. GREENING WIRE CO. LT'D.**  
PERFORATED METALS.

WIRE SCREENS FOR EVERY CLASS OF MATERIAL  
PERFORATED METAL OF STEEL, COPPER, BRASS,  
ZINC FOR ALL PURPOSES

SPECIAL ATTENTION GIVEN TO MINERS' REQUIREMENTS

**The B. Greening Wire Co. Limited**

HAMILTON, ONT.

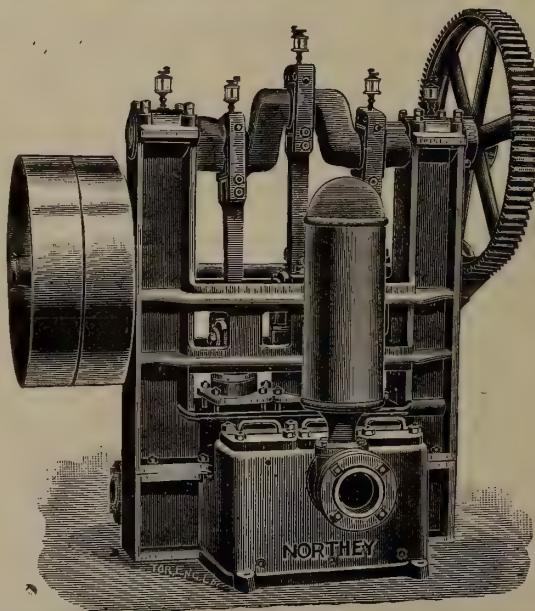
MONTREAL, QUE.

## Pumps for Mine Work

Triplex Power  
Pump . . . . .

We are manufacturing headquarters for all classes of Pumping Machinery. We have been in this business for a great many years and have given special attention to the construction of Mine Pumps. We are prepared to quote on Station Pumps; Pumps for bad Mine water; Pumps actuated by Electricity, Compressed Air or Steam; Sinking Pumps or Pumps for any special duty.

Catalogues, Plans and Specifications  
furnished on request.



We illustrate in this advertisement a typical Pump for Mine Work. This is our Triplex Power Pump, fitted with tight and loose pulleys as shown in cut. It is the regular Triplex type with the three cranks 120 degrees apart; crankshaft and connecting rods are of steel; gears machine-cut from the solid; plungers of brass and all details carefully worked out. This Pump is especially adapted for service with Electricity as the motor power.

**THE NORTHEY CO.,**

**Limited, Toronto, Ont.**



21st YEAR OF PUBLICATION.

# The CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING AND ENGINEERING JOURNAL PUBLISHED IN  
THE DOMINION OF CANADA.

B. T. A. BELL, Editor and Proprietor.  
Secretary, Canadian Mining Institute, etc.

Published Monthly.

OFFICES {Orme's Building, Ottawa;  
Windsor Hotel, Montreal.

VOL. XXII., No. 12.

DECEMBER, 1903.

VOL. XXII., No. 12.

## The Close of the Year in Cape Breton.

In the *Canadian Magazine* for December, under the heading "Canada for the Canadians," some information is vouchsafed to business men which will have created some consternation among many of those interested in the iron and steel industry at Sydney, Cape Breton. The writer, with a sublime indifference to truth, be gotten of a total ignorance of the subject he so airily discourses about, tells the *Magazine's* readers that the directors of the Dominion Iron and Steel Company are crying out for immediate protection against the U. S. Steel Corporation, which is said to be selling steel rails in Canada at \$28.00 and making \$10.00 per ton profit out of the transaction, while the unfortunate Canadian company (which, by the way, as every decently informed person knows, is not making rails) cannot live under the aggressive competition, even though it is assisted to the extent of \$10 or \$15 per ton by duties and bounties! It is marvellous that a reputable magazine should permit a contributor to get off such absolute drivel as this under the guise of information for business men. Nor is this all. This cockshure writer can see deep beneath the surface of things, and professes to know that the trouble is not at all with the competition from the U. S. Steel Corporation, but is something quite different. The *Canadian Magazine's* Munchausen is plainly "in the know," and now gives it out that some time ago (in 1899 we presume) a smart Bostonian of the name of Whitney, went down to Cape Breton and erected some structures of iron and brick on novel and executive lines, added some smokestacks and tall chimneys, painted the whole red, and sold out, before operation, to some bright Canadians, at a very handsome profit. The bright Canucks find that they have a white elephant (painted red!) on their hands, and in their blind rage are lashing out at things in general and the U. S. Steel Corporation in particular. We would in all seriousness counsel the editor of the *Canadian Magazine* to carefully revise in future the information served out by this very imaginative writer to business men. Such pernicious nonsense cannot be anything but mischievous in its effect. Every one knows, or should know, that the bulk of the capital subscribed for the Sydney works came from Canada. Moreover, in justice to the "smart Bostonian of the name of Whitney" we may state that recent Sydney papers were full of a visit paid to that town by the gentleman in question after an absence of two years, and that he appears to have been received by the community in general with every mark of welcome and esteem. In fact it is evident from the comments of the press and from descriptions of the receptions accorded to him, that Mr. Henry M. Whitney occupies a very secure

niche in the hearts of the people of Cape Breton. They know that if at the inception of the great enterprise which he set on foot, he, with others, was over sanguine as to results, and made miscalculations as to time and cost, he cannot be held blameworthy for the fatal policy of paralysis and drift of the past two years, which has brought a great and promising industry perilously near to the ragged edge of bankruptcy.

To review the Sydney iron and steel situation at the close of this year is not a very cheerful task. 1903 goes out under a cloud of depression and uncertainty, which must to some extent curtail the enjoyment of the Yuletide festivities. The staff has been very materially reduced, and the salary list and pay-roll have been subjected to a severe pruning. For a while in the early days of December it looked as if the reduction in the pay of ordinary laborers would not be submitted to without a struggle. The P.W.A. delivered an ultimatum, which was met by the management with a calm statement that any attempt at a strike would be the signal for a total suspension of operations for the winter. The business community, already affected by the laying off of a large body of men, was aghast at the prospect, and largely through the good offices of a committee of citizens, the P.W.A. was induced to recognise the seriousness of the step involved by a strike, and to withdraw from what was, under the circumstances, an untenable position.

To the average onlooker, untutored in the mysteries that enwrap the workings of great corporations, the wonder is not that the company is now weeding out its staff and making wholesale reductions in salaries and pay rolls, but that this policy was not put into operation a year, or eighteen months, or even two years ago. The works at Sydney during this period of time might have been likened to a large stable of high-priced hunters eating their heads off during a prolonged frost. However the hope that springs eternal has by no means left the breasts of those whose fortunes are bound up with the steel works. The present situation, unpromising as it may appear at first sight, is in reality more hopeful than it has been at any time since 1900. With the depletion of the exchequer, the policy of drift appears to have at length been abandoned for one of action and common sense. In the new president, Mr. J. H. Plummer, has appeared a man who seems to appreciate what is required to save the situation. After January 1st, the local management is to be placed in the hands of Mr. Graham Fraser, who has for so long been identified with the fortunes of the Nova Scotia Steel and Coal Co. His past record may be taken as an assurance that the days of sky-rocketing at Sydney are over, and that business will henceforth be conducted on lines of caution and economy.



The longtalked of, and much discussed, separation of the Steel and Coal companies has just been consummated by a special session of the Nova Scotia Legislature, and the Steel company is now freed from a lease which experience has proved could only be a heavy, and ultimately fatal, incubus. The directors are in a position to go right ahead with the erection of an efficient washing plant (the lack of which has been the chief cause of the trouble experienced in maintaining an adequate output from the blast furnaces) and with the completion of the rod and continuous mills. When these are in operation, the company can confidently expect from the government such protection as will ensure the home market for its product of finished, or semi-finished material. This stage once reached, the future of the industry is bound to brighten and improve. Everyone will rejoice if prosperity should be the ultimate destiny of this undertaking, even though the severe losses which thousands of *bona fide* investors throughout the Dominion sustained by the sudden collapse of the company's securities last spring, be never recouped. It seems inevitable that the Dominion Iron and Steel Co. must go down to history with an unenviable reputation as having been unaccountably mismanaged to the verge of ruin, and also as having been the vehicle of unscrupulous stock exchange manipulation.

If sympathy is felt for impoverished investors, some should be extended to the town of Sydney, whose citizens have made sacrifices, and incurred heavy responsibilities, only to find the Banks sitting on them like the nightmare that follows a lobster supper. The prosperity of the town is so intimately bound up with, and dependent, upon the fortunes of the great industry which it helped to establish at its doors, that collapse or temporary suspension of operations means heavy loss, or ruin, to many of its business men. However, the darkest cloud has its silver lining, and we are with those who hold that the worst is over, and we feel that we can wish the Dominion Iron and Steel Co. a bright and prosperous New Year with better hope of fulfilment than we could twelve months ago.

The history of the Dominion Coal Company in 1903 has been strangely checkered. The lease of it to the steel company in 1902, under terms of which 8 p.c. was guaranteed to the common stockholders, had given a market value to that stock which time has proved to have been fictitious. Following close upon the heels of the phenomenal collapse in the Spring, of the steel company's securities, which of course had a sympathetic effect on the stocks of the leased corporation, came the disastrous fire at one of its largest collieries, Dominion No. 1. Failure to get this fire under control, and the danger that threatened of its spreading to other collieries, caused quite a panic, which was not allayed by the sudden and unexpected resignation of the general manager, Mr. Cornelius Shields. The mine had finally to be abandoned to the process of flooding, and fortunately this was accomplished, and the fire extinguished, without any further disaster. Notwithstanding that this colliery has been practically a non-producer for many months, the output for the year is only fractionally below what it was last year.

The demand for coal has continued very good during the year and the season's operations, in spite of the heavy expenditure incurred at No. 1 Colliery, must make a very encouraging financial showing. At the present time the output is very large, having reached as high as 14,500 tons per day. No. 1 is making itself felt again, while the mammoth No. 2 has now assumed the lead, which it is likely to steadily increase from this time on. The old reliable Reserve, although surpassed at least by its younger and lustier rival, is still keeping up its record in a wonderful manner. The Hub mine has been again pumped out, and plans are being prepared for the opening of fresh shafts. It is probable that the splendid property lying between Sydney Harbor and

Lingan will be exploited ere long, and that new seams will be given a chance of measuring their qualities against the Phelan seam which has supplied the company with the bulk of its output for many years past.

With the recent granting by the Provincial Legislature of the decree nisi, whereby the coal company is freed from an ill fated union with its dissipated and spendthrift Steel consort, the officials of the former Company have migrated again to Glace Bay, as headquarters, and the auditing department will likewise be moved down to that point from Montreal. At the recent meeting in Montreal, Mr. F. L. Wanklyn was appointed Vice-President, as an understudy to Mr. James Ross, who expects to spend a good deal of his time abroad, and with Mr. G. H. Duggan, C.E. and an able and tried band of assistants to back him up in Cape Breton, the interests of the company should be well looked after. A new superintendent of mines has been appointed to succeed Mr. Ludwig, in the person of Mr. Austen King, who comes with a high reputation from Pennsylvania. We imply no disparagement of Mr. King's qualifications and abilities, if we venture to question the wisdom of introducing as superintendent of mines a man whose previous training may not have fitted him, and indeed may to some degree have unfitted him for this important post. Granted that he be as talented as they are made, a stranger from a foreign coalfield coming to this position is brought against an entirely new order of things, different class of labor, different methods of mining, different mine's regulations, a different character of mines, and of everything connected therewith, which must necessarily take him a very long time to thoroughly master and get accustomed to. We hesitate to believe that Cape Breton and Nova Scotia are so impoverished in respect to good, sound, pitmen that these importations from a far country are necessary.

While there is no diminution of activity in sight at present, and while indeed preparations are being pushed forward for a largely increased output, signs are not wanting that in 1904 the Dominion Coal Company will be put to it to market the larger quantity they expect to ship, at the level of profit which has prevailed during the past two years. The shipments from competing sources are steadily increasing, and with the re-imposition on the 15th January of the American duty (which it will be remembered was suspended for a year, as a result of the strike in the anthracite region) the United States, outside the regular shipments to Everett, will practically be closed to the importation, under normal conditions, of provincial coal. The Canadian demand is not elastic enough to respond to any marked increase in supply, but the Dominion Coal Company's sales department under the management of our genial friend Mr. A. Dick, is enterprising, and resourceful, and may be trusted to find, as it has already done in the past, fresh outlets abroad for any surplus coal.

At the close of a year that has been marked by much that has been painful, or even disastrous, for both concerns, we welcome the brighter prospects that now appear to lie before the Dominion Iron and Steel and the Dominion Coal Companies and we extend the REVIEW's best wishes for a prosperous New Year to both.

CANADIAN MINING INSTITUTE.—At a largely attended meeting of the Toronto members of this progressive organisation arrangements for the annual meetings to be held on the 2nd, 3rd and 4th March next, in that city, were forwarded. Mr. W. G. Miller, Provincial Geologist, was appointed secretary of the local Committee of Arrangements. The meetings will be held in the fine new King Edward Hotel. On the Saturday following the meeting there will be an excursion to the power plants, electro-metallurgical and other works of interest at Niagara Falls. The secretary, Mr. B. T. A. Bell, has a fine programme of papers already arranged for these meetings.



### The Centre Star Report

The fifth annual report of the Centre Star Mining Company, submitted at the annual meeting held November 24th, presents the company's affairs in the most favourable light that the public has yet seen. For the first time in its existence the Company is reported free from all indebtedness, and in possession of an earned surplus for the year of \$88,157.12; the balance of profit and loss account carried forward being \$150,798.35. This showing is a most creditable one, and is altogether due to the energy and ability of its manager Mr. E. B. Kirby.

The tonnage produced and sold amounted to 88,387 tons, of an assay value of \$1,153.390, or \$13.05 per ton; the total freight, treatment and marketing charges amounted to \$7.05 per ton, leaving a local value of \$6 to the ton of ore. The total expense of production, *including all costs*, was \$3.30 per ton shipped, of which \$2.67 is given as the *mining* cost, and \$0.63 as office and administration costs. The real profit per ton, therefore, was \$2.70 on ore assaying \$13.05, or a profit margin of 20 p.c. on the assay value.

We advise shareholders to carefully compare the value and costs per ton for 1903, with the same figures for previous years, as in this way only will be appreciated the efforts and successes made by Mr. Kirby during the last two or three years, and for which he is entitled to the very highest credit. THE REVIEW has made this comparison, and, holding that the difficulties and disadvantages prevailing during the year ending Sept. 30th, 1902, exclude that year from any just comparison, has taken the year 1901 as the best year by which to show the magnitude of what has been accomplished.

The tonnage for 1901 closely approximates that for 1903, being 80,419 against 88,387. The assay value for 1901 was \$18.12 per ton, for 1903 was \$13.05, showing a shrinkage of \$5.07 per ton. The total charges (freight, treatment and marketing) for 1901 were \$9.48, for 1903, \$7.05; showing a reduction of \$2.43, which reduction is due to Mr. Kirby's efforts with the Canadian Smelting Works and the Canadian Pacific Railway. The local value of the ore in 1901 was \$8.63 and in 1903 was \$6.00, showing a decrease, in what the Company call "smelter's net value," of \$2.63. To offset the reduction in assay value of \$5.07, the company has effected a saving of \$2.43 in freight and treatment charges; and for the shrinkage of \$2.63 in net value, Mr. Kirby has effected reductions in the mining costs which, from his own tables, show figures of \$3.21 for the year ending 1901, and of \$2.67 for the year ending 1903, a saving of 54c. The amount of money expended on development work is much less than in previous years, being only 60 p.c. of the amount spent in 1901, and about 43 p.c. of what was expended in 1902.

The reasons for this decreased expenditure may be inferred from Mr. Kirby's report, which is significant as containing two statements of great import to the district of Rossland. There is no better authority on the camp than Mr. Kirby, and when he states that all the productive mines there have experienced a general change in the character of their ore deposits as depth is attained—having passed from high grade smelting ores to ores too low in grade to be treated directly by smelting, and that therefore they require a concentration of values before they can be marketed—the public may accept the statement as an absolute fact.

The second noteworthy and significant feature in the report is, the direct assertion by Mr. Kirby of the feasibility and profit of concentrating the pyrrhotite ores of the camp, and the statement that a subsidiary corporation is now building a mill of 200 tons daily capacity for such concentration, the mill being designed so that it can be promptly doubled in its capacity.

The two statements noted above are the main features of the

report; the decline of values is the experience of most mining districts throughout the world; the building of a large plant to concentrate the ore is the sequel to the announcement made in the report for 1902, and our comments at that time need not be repeated. It is perhaps to be regretted, from the standpoint of our readers, that Mr. Kirby has not yet seen fit to outline to his shareholders the process which he deems will be successful for the concentration of low grade ores, but there are doubtless many personal and company reasons why it is unadvisable at present to publish such details. We can only hope that after the Company is thoroughly satisfied Mr. Kirby will contribute to the Canadian Mining Institute the details of the method which he has perfected.

THE REVIEW sincerely hopes that an optimistic view may be taken of the Centre Star process for the concentration of low grade ores, since the practical success of any such method means an active life, not only to that particular district, but also, probably, to other districts in British Columbia, and means the restoration to the Province of some of the favor which it has lost during the last three or four years. We do not look for the immediate success of *any* installation, feeling that the problem presents many difficult details which require time for their successful treatment, but we do think that this beginning on the part of the Centre Star Company may mean the ultimate establishment of a permanent industry in the Rossland District. The LeRoi No. 2 Company has, according to various announcements in the press during last 12 months, made a trial of the Elmore Process of oil concentration, which is uniformly reported to be successful.

While we are not "in the know" respecting Mr. Kirby's process, we have been informed that it differs essentially from the Elmore, and that it has been thoroughly tested on a considerable scale at the old works at Silica which were remodelled for that purpose. The Company and the shareholders are to be congratulated upon having retained the services of one who is so well able to undertake the solution of difficult problems as their general manager. THE REVIEW extends its congratulations to Mr. Kirby, and hopes that next year it may be able to do the same to the shareholders of the Centre Star Company.

### Hand Sorting vs. Milling.

The Arlington Mine at Erie, B.C. is an irregular vein in a slate formation. The vein has a very slight dip to the west, and sometimes lies conformably with the slates, and sometimes cutting across them. The slate formation is very much broken up and contorted, and there are layers of porphyry sometimes following the bedding of the slates and sometimes cutting across them at various angles and with different strikes. The ore consists of mixed sulphides of iron, lead and zinc; and the gold values vary greatly, sometimes values as high as 19 oz. of gold per ton in the mine car samples occur where the ore contains a larger proportion of zinc sulphides. The vein varies from a few inches to as much as 25 feet in thickness, but the sulphides are always in separate and distinct layers or bunches free from the surrounding vein matter, and the remaining vein matter contains practically no value. This fact of the ore being separate from the vein matter has an important effect on the question of hand sorting or milling, as also the fact that concentration only increases the value of the ore about (ten) 10 p.c., that is the clean ore shipped averaged \$49.35 per ton, while the concentrates averaged \$54.66 (assay value).

During the fifteen months from March 1901 to May, 1902 a concentrator and tramway were built and the mine was worked as a concentrating proposition, the whole width of the vein being broken in the stopes and put through the concentrator; a portion of the clean ore being sorted by hand and sent direct to the smelter.









MR. HIRAM DONKIN, C.E.,

Who is reported to have been re-engaged in a directing position with the Dominion Coal Company. Mr. Donkin was for several years manager of the company, and since then has held an important position with the Nova Scotia Steel and Coal Company.



CAPTAIN R. G. EDWARDS LECKIE, M.E.,

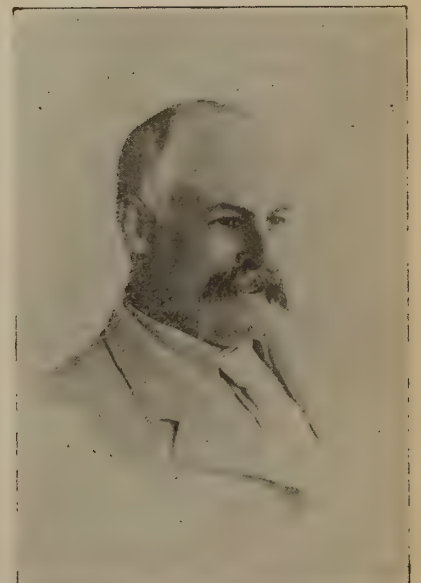
Who, after serving with distinction in South Africa, was dangerously wounded by a leopard in Somaliland where he holds an important gold mining concession. Captain Leckie is now on his way to Canada and, we are glad to say, is making a speedy recovery.



MR. EUGENE COSTE, M.E., TORONTO.  
Re-nominated as President of the Canadian Mining Institute for the year 1904-1905.



MR. GRAHAM FRASER, SYDNEY, C.B.  
Who assumes on 1st January the direction of the affairs of the Dominion Iron and Steel Company.



MR. LESLIE HILL, C. & M.E.  
Who has done so well with the Arlington Mine, at Erie, B.C.



of the deposits and surrounding area as could be made at the season of the year, snow having already begun to fall in the district.

The deposits were discovered during the building of the Temiscaming & Northern Ontario, the government railway, which is now under construction from North Bay junction, on the Canadian Pacific, to the head of Lake Temiscaming. The road-bed of this new railway runs almost over the top of the first of the deposits discovered. The ore bodies lie five miles south of Haileybury, one of the two sister villages on the Ontario side of the northern part of Lake Temiscaming. Haileybury, following the railway, lies about 106 miles north of North Bay station, which is, by the Grand Trunk Railway, 227 miles north of the City of Toronto.

As the deposits were discovered quite recently, and the surface is now covered with snow, very little prospecting has been done in the surrounding area. The discoveries were made by men employed on the railway, and not by regular prospectors; hence the work has not been done as systematically as it might have been.

When I visited the locality, recently, four veins had been located in the vicinity of a small body of water known as Long Lake, which is not shown on existing maps. It lies about one-half mile south of the southern boundary of lots 8 and 9 in the first Concession of the Township of Bucke. The reports of other finds were not verified.

Each of the four veins visited was found to carry cobalt. Nickel also appears to be present in all of them; but as the weathering of the cobalt compounds masks, at times, the nickel colors, this latter metal was not definitely recognized in two of the deposits, although it doubtless occurs wherever the cobalt is found. Three of the veins are rich in native silver. The veins occur in unsurveyed territory, and, as the locations are as yet unnamed, we shall speak of them as Nos. 1, 2, 3 and 4. The outcrop of No. 2 lies about one-half mile southwest of No. 1, and No. 3 the same distance southwest of No. 2. The outcrop of the fourth vein is about one-half mile southeastward of No. 3.

Very little work has been done on any of the veins, and as the surface is pretty well covered with moss and soil, it is impossible to state what is their horizontal extent.

All of the veins cut through one or both of the formations known in the district as Huronian slate and breccia-conglomerate. The latter rock is considered to be composed of volcanic ejectamenta—grains and fragments of rock of various kinds which have become consolidated. The slate conglomerate of older Canadian writers, Logan and Murray, is a variety. The slate along the railway cuts, in the vicinity of Long Lake, contains occasionally fragments of pink granite, which are, at times, a couple of inches or more in diameter. On the faces of some of the vertical cliffs, the well-banded slate at the bottom is found to pass gradually into massive breccia-conglomerate at the top, the fragments in the latter being of varied composition, and ranging in size from small grain-like fragments to pieces of rock a foot in diameter.

The presence of dikes or sheets of some of the darker-colored eruptives was suspected, but they were not definitely recognized. In the field they would resemble rather closely some of the more massive varieties of the slate and finer-grained breccia.

The slate and conglomerate have a slight dip, and the veins referred to cut them almost vertically. The strike of veins Nos. 1 and 3 is approximately northeast and southwest; that of 4 is east and west; that of 2, northwest and southeast. Diabase and gabbro invade these fragmental rocks in some parts of the district, and appear to underlie most of the area. About three miles to the northward of Long Lake, Silurian limestone overlies the Huronian, but the limestone is undoubtedly of younger age than the veins.

Vein No. 1 lies east of the railway track, at the edge of a swamp, about one-quarter mile north of the end of Long Lake. It has been

uncovered at three points, which are within a few yards of one another. As the surface of the rock is low here, and little of it is exposed, it is difficult to tell much about the form of the deposit. Medium grained, dark-colored conglomerate is found on one wall. At the widest opening, the deposit has a width of over 6 ft., but the vein matter is more or less mixed with rock. The ore consists of niccolite, or the arsenide of nickel, and smaltite, the diarsenide of cobalt, together with much native silver. Niccolite contains, theoretically, 43.9 per cent of Nickel and 56.1 of arsenic. Smaltite carries 28.2 per cent of cobalt and 71.8 of arsenic. It may be added that the ore of nickel now worked in Ontario, the iron sulphide or pyrrhotite of Sudbury, in which nickel occurs not as an essential but as an accidental constituent, carries, on the average, less than 5 per cent of the metal. On weathered surfaces the vein matter is coated with the beautiful pink decomposition product, cobalt bloom. The green nickel stain is also seen on some surfaces, but is usually masked by that of the cobalt. This nickel compound is probably the arsenate, annabergite, but nickel silicate may also be present. The secondary mineral, arsenolite, was seen on some specimens. The native silver occurs as films, or leaves and fine threads, or moss-like forms, through the nickel and cobalt minerals, especially in the niccolite, as well as in cracks in the rock and in the calcite veinstone. In weathered portions of the ore the silver shows distinctly. Some lumps of weathered ore, weighing from 10 to 50 lb., carry a high percentage of silver. One sheet composed chiefly of silver, attached to a rock surface, had a thickness of nearly 0.375 in. and a diameter of about 1 ft. Professor Wm. Nicol has recognized the antimonic silver, dyscrasite, as was suspected in the field, in association with the native silver. He has also proved the presence of chloanthite,  $\text{Ni As}_2$ . It is associated with the niccolite, and also occurs, pretty free from cobalt, in some of the nodular masses in the calcite. The silver appears to have crystalized earlier than the niccolite, which has been deposited around it. The cobalt arsenide has formed still later than the niccolite.

Little laboratory work has yet been done on the specimens collected. Analyses of the ore, unless of samples representing a large quantity, are of little economic value, although they are of scientific interest. A sample showing native silver was found by Mr. A. G. Burrows to possess the following percentage composition: silver 26.24, value \$5,237.60 per ton, cobalt 8.34, nickel 5.26, arsenic 13.28. Another sample composed essentially of niccolite contained 5.02 oz. of silver to the ton, and nickel 26.64, cobalt 6.16, arsenic 45.64 per cent.

A small hand specimen of the rock, which occurs mixed with the ore and gives it the character of a brecciated vein, shows a sharp contact between the fine grained slate, ash rock, and a medium grained rock of similar composition.

As so little work has been done on this ore body, it is difficult to determine whether the three openings belong to one vein, or whether the ore occurs in a more irregular deposit, although the chief opening appears to be on a vein-like body. The ore is undoubtedly very rich, containing values in nickel, cobalt, silver and arsenic, and a comparatively small vein could be worked at a handsome profit.

On location No. 2 the ore-body is distinctly vein-like in form. The ore here is a mixture of smaltite, and probably some closely related arsenides of cobalt, such as safflorite, and niccolite. The only complete analysis which has yet been made of the ore from this locality was that of a sample from this vein. It was found to have the following percentage composition: Cobalt, 16.8; nickel, 7; iron, 6.3; arsenic, 69; rock matter, 0.9; total, 100. An average sample taken by the writer across the vein at one point gave the following percentages: Cobalt, 16.76; nickel, 6.24; arsenic, 66.60; sulphur, 3.37. Antimony and silver were found to be absent. This ore-body, unlike the other three



examined, carries no silver in the parts so far uncovered. Three openings have been made on the vein over a length of 300 ft. The massive ore has a width of 14 in., but vugs in the wall-rock, 2 ft. or more from the vein, are filled with cobalt bloom. The rock of both walls is slate. The walls are well defined, and the vein dips almost vertically, the strike being toward the southeast. The vein lies on the hillside, a few hundred yards east of Long lake and the railway, and, unlike ore-body No. 1, is at a height of about 70 ft. above the water level. Although the width of this vein is not great, the character of the ore is such as to make it promising, at the present prices of the metals contained in it.

The ore has a massive appearance, and a rather dark-gray color, where not coated with cobalt bloom. When examined carefully, however, in hand specimens, especially if a polished surface be examined with a magnifying glass, it is seen to be a mixture of a gray mineral, which is chiefly smaltite, and the reddish mineral, niccolite. Smaltite and the corresponding arsenide of nickel, chloanthite, are claimed by most authors to pass into one another by the substitution of cobalt for nickel, and *vice versa*. Niccolite, in the analyses quoted by Dana and others, carries only a small percentage of cobalt and iron, while smaltite and the other diarsenides of cobalt frequently contain much iron and nickel. In the ore under consideration, the cobalt and nickel appear to be, for the most part, in distinct compounds. In the analysis quoted, if we consider the 7 per cent. of nickel to exist as niccolite, and the percentages of iron and cobalt, 6.3 and 16.8, respectively, to exist as smaltite, the theoretical percentage of arsenic in the ore should be 68.47, instead of 69, as found by analysis. The percentage of niccolite by weight would be 15.94, or about one-seventh part of the whole by volume, since niccolite has a somewhat higher specific gravity than smaltite. The specimens, when examined with the magnifying glass, agree with this. The niccolite has crystallized earlier than the smaltite, which forms the ground-mass through which the niccolite grains are set.

Minute, brilliant, silver-white or tin-white crystals occur sparingly, embedded in the wall-rock and in the ore. The crystals occur in cubes, and in combinations of this form with the pyritohedron, or rhombic dodecahedron, and octahedron. Prof. Nicol who has measured some of these on the goniometer has found them to be smaltite. The white or grey colored arsenides show a tendency to form globular or spheroidal masses, with a radiated structure. Some of these masses in the calcite have a diameter of over half an inch. The ore is at times somewhat porous, spaces being left between the globules, which are tarnished almost black on their surfaces. Where not coated with cobalt bloom, the weathered surface of the ore has a dark color, not unlike that of the wall-rock. On a fresh surface, the more massive ore resembles mispickel, but is somewhat darker in color. Small grains of quartz are found sparingly in the ore. The proportion of nickel to cobalt in this case is less than that in No. 1. A more detailed study of the form and chemical composition of the minerals is being made.

A deposit carrying galena and copper pyrites lies a short distance southeast of vein No. 2. Very little of its surface is uncovered and no analyses have been made of the samples collected. Grains and small masses of copper pyrites were seen in the slate, in the railway cuts, in the vicinity of deposit No. 1.

Ore-body No. 3, so far as could be seen, is similar in character to No. 1. It lies at the southern edge of Long lake. The ore consists of native silver, smaltite and cobalt bloom, and, in all probability, niccolite also.

Vein No. 4, although having the smallest width of the four, is, in many respects, the most interesting of the group. Here a perpendi-

cular bare cliff of rock, 60 or 70 ft. high, faces west. The vein, whose width averages not more than 8 in., cuts this face at right angles, and has an almost vertical dip. The vein is weathered away, leaving a crack in the face of the cliff 2 ft., in some places 4 or 5 ft., in depth. When I saw it first, it had not been disturbed. Thin leaves of silver up to 2 in. in diameter were lying on the ledges, and the decomposed vein matter was cemented together by the metal, like fungus in rotten wood. It was a vein such as one reads of in textbooks, but which is rarely seen, being so clearly defined and so rich in contents. It was found impossible to get a fresh sample of the ore with the prospecting-pick, the vein being so much decomposed. The weathered specimens, however, in addition to the native silver, contained cobalt bloom; and the unaltered ore will be found, in all probability, to consist of smaltite and niccolite, in addition to the silver. It may also be added that, in one part of the vein, a distinct banded structure was noticed. Across a distance of 8 in. there were 12 or 14 layers of ore lying parallel to the walls. At the bottom of the cliff the vein cuts thin, banded, dark-grey or greenish, at times almost black, slate, which has a slight dip. This slate passes gradually, so far as could be determined from the steep character of the cliff, into coarse breccia-conglomerate in the upper part. The fragments in the conglomerate consist of quartz, slate, granite and other rocks.

On some of the weathered surfaces of the native silver specimens there are small, black, spheroidal masses, with little luster. These appear to be the hydrated oxide of cobalt, heterogenite. Some of the deposits on the silver resemble asbolite. The carbonates of cobalt and nickel are also probably present. Antimony and sulphur have been detected in the ore of veins 1 and 2. Detailed analyses are required to determine the character of some of the silver-bearing minerals, which are present in small amounts. Bismuth, copper and manganese, in an association of ores such as we have in these deposits, are to be looked for.

These recently-discovered ore bodies lie about 90 miles northeast of the town of Sudbury, in the vicinity of which are situated the well-known nickel mines. The ore of the latter is of a different character from that of the Haileybury deposits, being essentially pyrrhotite and copper pyrites. The rock associated with the Sudbury deposits, which are not veins, but deposits of irregular shape, is norite, a variety of gabbro; the ore itself is claimed by most writers to be of igneous origin. It is thus seen that there is little in common between the ore-bodies of the two localities, with the exception that nickel is a characteristic metal of each. The Sudbury pyrrhotites carry a small percentage of cobalt in addition to nickel. The minerals niccolite, danaite, and other arsenical compounds, have been found in some of the Sudbury deposits, but only in small quantities.

It is of interest to note that a deposit of sulpharsenide of iron, mispickel, was discovered a few years ago near Net Lake, which lies about 25 miles to the southwestward of the Haileybury deposits. This mispickel, however, does not carry appreciable amounts of nickel, cobalt or silver.

On the Quebec side of Lake Temiscaming, about nine miles to the northeastward of the Haileybury deposits, an ore body, known as the Wright silver mine, was discovered many years ago by some of the early explorers of that region. During recent years, this deposit has been worked for its lead and silver contents. The deposit is unique in character, the wall-rock being Huronian breccia-conglomerate, the fragments in which are, at times, cemented together by argentiferous galena.

Silver-bearing galena with copper pyrites is also found on an island in Cross lake which lies southeast of Lake Temagami, and at Lady Evelyn Lake.



The only area in Ontario, or central Canada, which has hitherto been found to contain deposits of rich silver ore is that which lies near the head of Lake Superior, nearly 500 miles from Haileybury. While native silver has been found in considerable quantity in these deposits, the sulphide, argentite, is the more characteristic ore. The Silver Islet mine, near Port Arthur, is well known to those interested in the metal industry. Deposits of somewhat similar character, which occur on the mainland, have also been frequently described. The report on "Mines and Mining on Lake Superior," by Mr. E. D. Ingall, of the Canadian Geological Survey, gives an account of this silver-bearing area.

The silver veins in the vicinity of Port Arthur, like those of Haileybury, cut through slate, but the Port Arthur slates are held to be of later age—Animikie—than those of Haileybury, which are what is called, in a general way, Huronian. Much work remains to be done on our metamorphic and igneous rocks before the various formations can be correctly correlated. Both the Port Arthur and Haileybury slates have been disturbed by eruptions of diabase and related rocks.

The rich silver-bearing veins in the Port Arthur district, like those of Haileybury, occur for the most part as vertical fissures which cut fragmental rocks whose beds lie in a nearly horizontal position. Although the fragmental material of which the silver-bearing rocks are composed is not similar in the two districts, the writer is inclined to believe that the ash rocks and agglomerates of Haileybury are of almost, if not exactly the same age, as the argillites Animikie, of the head of Lake Superior.

In this paper the term slate has been used in referring to the fine grained and delicately laminated rocks through which the Haileybury veins cut. This term properly refers to argillites and should not be used except as a convenient field term for all of the finely laminated rocks in the area. Thin sections when examined under the microscope show that the specimens so far investigated represent ash rocks. Coarser varieties, in which the fragments possess a size similar to that of the grains of minerals in a medium grained igneous rock, are found to be made up of pieces of orthoclase, plagioclase, trachytitic material, chlorite and calcite which is an infiltration product. The layers of some of the slate-like rocks which lie at the bottom of the cliffs have not been examined in the laboratory.

A correlation of these Haileybury rocks with the slates and tuffs of the area which was marked as being doubtfully Cambrian on Dr. Robert Bell's map of the Sudbury district would be interesting.

Dr. A. E. Barlow has given a very interesting account, (Geol. Surv. Can., Vol. X, p. 194 I) of the contact between a granite and the overlying fragmental rocks in the vicinity of Baie des Pères, on the opposite side of Lake Temiscaming from Haileybury. He has shown that this is, so far as has been observed, a unique occurrence—some of the Huronian fragmental material overlying the granite having been derived from the weathering of this rock *in situ*. The present writer recorded the occurrence, some years ago, of a small outlier of Grenville limestone in the vicinity of Lake Kippewa, east of Lake Temiscaming. This limestone and the associated garnetiferous schist have been much disturbed by an intrusion of granite apparently similar to that of Lake Temiscaming. It would, therefore, appear that the Baie des Pères fragmental rocks which rest on the eroded surface of the granite are very much younger than the Grenville veins of the indefinitely so-called Laurentian. The question then arises—are we at present certain that the Baie des Pères fragmental rocks are older than the Animikie?

It is known that rocks similar in character to those of Haileybury lie to the northward. In the writer's report on "Lake Temiscaming to the Height of Land" published in Vol. XI of the Report of the

Bureau Mines, 1902, the following statements are made concerning the slate and breccia-conglomerate or agglomerate in the area examined. P. 217:—"Slate is also seen at the outlet of the lake, passing into conglomerate a short distance down the river. The latter rock appears to overlie the former." P. 219, "On the east shore near this point, the rock has a bedded appearance, the layers being ten or twelve inches thick, slate forming the lower layers with an impure quartzite above. Along this lake these rocks dip at a low angle, 15°, to the southwest. The quartzite, or graywacke carrying quartz grains, lies above the slate, and the conglomerate appears to overlie the quartzite. If this is their order they have either been inverted or they possess a different relationship from that given for similar rocks by the Geological Survey in the report on the Lake Temiscaming map sheet. The question as to their relationship is of economic interest on account of the occurrence of iron ores." P. 220, "The slate along the shore here has a dip of about 7° to the eastward or towards the island just mentioned. A hill up the shore to the northward was found to be composed of conglomerate containing fragments of slate, quartz, gray granite, and a porphyritic gray granite, together with a few red Jasper pebbles associated with hematite. The conglomerate appears to overlie the slate and the whole dips towards the islands, which also contain conglomerate." The word "appears" was used in these sentences on account of it having been held by other writers in the field to the south that the conglomerates or agglomerates were the basal rocks. The present writer having made a hasty examination of the area did not wish to state positively that the rocks, as he saw them, occupied their original relative positions, although they appeared little disturbed. Some of the agglomerate is very loosely cemented together.

Although cobalt and nickel minerals have not been found in quantity near Port Arthur, it is interesting to know that the ore of the Silver Islet and some of the other mines was, at times, coated with cobalt bloom. Niccolite and other minerals carrying cobalt and nickel occur in small amounts in some of these deposits. The only deposits in which quicksilver has been found in Ontario is that of Silver Islet, where chloride of silver is also said to occur as a decomposition product.

Small quantities of cobalt, nickel and silver-bearing minerals occur on Michipicoton Island, Lake Superior. Arsenical compounds of the first two metals have been found at several other localities in Ontario and at Calumet Island, Quebec. It will be noticed that the association of minerals in these Haileybury veins is not unlike that found in some well-known deposits of Germany and other countries. Since these German ore bodies have been worked for many years methods for extracting the metals, cobalt and nickel, from ores of this kind are well proved. Hence little experimenting will have to be done on the Haileybury minerals.

Although little prospecting has been done in the vicinity of the Haileybury deposits, it would appear, from the discoveries already made, that ore-bodies occur there which can be worked profitably for the metals which have been mentioned. It is scarcely probable that nickel will be found in sufficient quantity in these deposits to interfere materially with the lower grade, but large, deposits of the Sudbury area.

Slate and conglomerate, similar in character to those of Long Lake, cover a very large, as yet little prospected, area in northern Ontario. These rocks, along the government railway, a considerable distance south of the deposits described in this paper, contain indications of the presence of cobalt ore.

It is stated in "The Mineral Industry" that "cobalt, which is used in the arts, chiefly in the form of oxide, is obtained from New Caledonia, Australia and Germany, and smelted in France, Germany



and Great Britain, the Messrs. Vivian, of Swansea, being the chief buyers in the last-named country." Cobalt oxide is produced at one plant in the United States.

The ore of New Caledonia, which is the world's largest producer, shipping about 3,000 tons yearly, is cobaltiferous wad, containing 25 to 30 per cent manganese and 2 to 8 per cent cobalt oxide (CoO). The ore of New South Wales is similar in character. In both countries the cobalt ore is a decomposition product, and occurs in irregular deposits, similar to those of bog iron ore.

"At the end of 1901 and the beginning of 1902 the price of cobalt ore, containing 4 per cent. cobalt, in New Caledonia, was forced up higher than circumstances warranted. For a long time the price in Europe did not justify more than 90 fr. per ton being paid for this quality of ore at the mines, but the price steadily rose to 330 fr. (about \$66) until recently, since which it has receded." The black oxide of cobalt sells at from \$2.26 to \$2.30 per lb., or the metallic cobalt in the compound brings about \$3 per lb. It would thus seem that the refiners should make a much larger profit than the miners. The market will not, however, stand a greatly increased production without the prices materially decreasing. It is claimed that there has been a combination among refiners to keep up the prices of the artificial cobalt products.

A paper recently published, "Cobalt Mining in New Caledonia," by Mr. Colvocoresses' Eng. and Min. Journal, Nov. 28th, 1903, gives a later account of the industry in that country. It is shown that in 1902 the output was 7512 tons, or nearly double that of any preceeding year, the statistics being given from 1889. The prices have kept up better than it was expected the would two years ago, being in September, 1903, 350 fr. (about \$70) for 5 per cent, ore with a rise of 12 fr. per ton for each 0.1 per cent. above.

I would be pleased to receive inquiries from buyers of cobalt ore, and other minerals which are associated with it in the vicinity of Hailbury, with the object of putting them into communication with producers. Shipments could be made during the coming winter.

## EN PASSANT.

Mr. Eugene Coste, E.M., probably the foremost living authority on the subject of Natural Gas and Petroleum, has been unanimously nominated to a second term as President of the Canadian Mining Institute. Prior to the discovery and development of the Welland Gas Field under Mr. Coste's able supervision he held the position, for a number of years, as Chief of the Division of Mines and Mineral Statistics in our Geological Survey.

Mr. Lucien S. Robe, C., & M.E., who has charge of the important hydraulic gold mining operations on Miller Creek, Y.T., owned by the N.A. T. & T. Company, has consented to present a paper at the ensuing annual meeting of the Canadian Mining Institute on the subject of "Hydraulic Mining in the Yukon: Its Present and Future". Mr. Robe is one of the ablest engineers in the Yukon, and it is expected he will have something of interest to say concerning the regulations governing hydraulicking in our great northwestern gold fields.

It is understood that the Yukon Hydraulic Commission has secured the services of Mr. John E. Hardman, Mining Engineer, Montreal, and Mr. John B. Hobson, Mining Engineer, Bullion B.C., as consulting mining engineers to the Commission. Owing to the voluminous character of the evidence to be considered and the enormous quantity of Exhibits—over 300, we believe—it is not expected that the report of the Commissioners will be made public for some time, although the Commissioners, Mr. Justice Britton and Mr. B. T. A. Bell, are understood to be steadily working on the enquiry.

Mr. A. N. C. Treadgold, of the Treadgold Water Concession, who has been in Ottawa for some time, since the close of the summer mining season in the Yukon, sailed for the Old Country the last week of this year.

Mr. William Blakemore, Mining Engineer, has removed from Montreal to Nelson, B.C., where he will practice in future. He will, we are sure, have the sympathy of a very large circle of mining friends in the severe loss he has sustained by the death of his eldest daughter, Susan Mary, a very loveable girl.

Mr. E. B. Kirby, E.M., the indefatigable general manager of the Centre Star and War Eagle mines, is the unanimous choice of the Nominating Committee for the only vacancy in the vice-presidency of the Council of the Canadian Mining Institute occurring this year.

Mr. S. H. Boright, Sutton, Que., a student in Mining Engineering at McGill University, has been awarded by The Canadian Mining Institute a cash prize of twenty-five dollars for his paper "On the Geology of the Northern Portion of the Boisdale Hills Anticline." A similar amount has been awarded by the Institute to Norman W. Parlee, of Rossland, B.C., for his paper on "Rock Drilling and Blasting," contributed to the Mining Section. There were nine papers presented by students. The award of the President's gold medal in the same competition is not yet announced.

Dr. Eugene Haanel, Dominion Superintendent of Mines, Ottawa, will leave for Europe early in the New Year, having been appointed by the Government, chief of a commission to enquire into the question of the "Electric Smelting of Iron Ores." Dr. Haanel will be accompanied by an electrical engineer, a draughtsman, photographer, and secretary. The report of this commission will be invaluable.

Mr. A. J. Beaudette, Territorial Mining Engineer, Dawson, Y.T., will spend the winter in California continuing his investigations into the methods of hydraulicking and water supply in that state.

E. L. Wrigglesworth & Co., who have the contract for the construction of 250 coke ovens for the Crow's Nest Pass Coal Company, at Michel, state that owing to the delay in the delivery of the brick they were unable to complete their contract within the specified time. They have already completed 116 ovens and have entered into a bond to complete the remainder by July 1st, 1904. The contract price for the 250 ovens will exceed \$250,000. In a contract of this kind 300,000 silica brick and 155,000 firebrick are used. The latter are very expensive, and cost delivered at Michel from 8 to 14 cents apiece. The fire brick are imported from Pittsburg. Experience has proven in the coal fields of Pennsylvania, where coke is made at Connellsville and elsewhere, that the silica brick for crowns is the best. These are also imported from Pittsburg. The duty and the cost of transportation are large items, and cut quite a figure in the cost of the construction of the ovens.

Mr. John B. Hobson, managing engineer for the Consolidated Cariboo Hydraulic Mining Company, Bullion, B.C., is now in Toronto conferring with the director's of his company. Mr. Hobson's operations have for the past four years suffered from exceptionally dry seasons but he reports the outlook for 1904 as more hopeful.

Mr. J. Walter Wells, formerly in charge of the Ontario Government Assay Office at Belleville, has been appointed Chief Assayer for the Dominion Government at Vancouver, handling the gold dust and bullion from the Yukon and western mines.

It is understood that the resignation of Mr. Albert I. Goodell as superintendent of the Montreal & Boston Copper Co's. smelter at Boundary Falls, B.C., tendered to the directors several months ago, has now taken effect. The name of Mr. Goodell's successor has not yet been announced.

Mr. W. B. Hudson, of Nelson, B.C., late foreman at the Enterprise mine, left recently for San Francisco, and will spend the winter in the Golden State.

Mr. A. H. Reeder, who succeeded J. H. Tonkin as general manager of the Crow's Nest Pass Co. has in turn thrown up the position and departed eastward with his family. The name of Mr. Reeder's successor is unknown as yet, and no reason is ascribed for his unexpected resignation.

Mr. G. W. Cornish, an Australian mining man who was recently in Ottawa, on his way to British Columbia, has reached the coast and will make his headquarters at Greenwood, B.C., from which point he will thoroughly



explore the surrounding district. Mr. Cornish came to Canada from England for the purpose of looking up some mining propositions in the western province which he has been commissioned to secure by Australian capitalists. Mr. Cornish was the mining representative of the Queensland government at the Glasgow exhibition in 1901, and also at the Earls Court exhibition in London.

Mr. Jos. Mackay, for some time past sub-recorder at Harper's Creek, Horsefly, Cariboo, has returned to the Coast, the sub-recording office he has had charge of having been closed. Mr Mackay was sent up to the district in January 1902, at the time of the excitement in connection with the reported finds of rich placer ground on Eureka Creek at the headquarters of the Horsefly.

Mr. W. Yolen Williams, superintendent of the Granby mines, has left Phoenix on a two-months' vacation to Minnesota and Michigan.

Mr. J. D. Graham, formerly Gold Commissioner for the Atlin district, has returned from a visit to France, and is now in Victoria.

Mr. E. E. Reynolds, of Wilkesbarre, Pa., has been engaged by the International Coal & Coke Co. as general superintendent.

Mr. P. Kirkgaarde, superintendent of the Canadian Goldfields Limited, at Deloro, Ont., has been appointed manager of a large company recently organized in Toronto to exploit the extensive corundum deposits of Eastern Ontario. The company has already secured about 600 acres in the township of Raglan in Renfrew county, and it is said will erect at once one of the largest corundum plants in the world. Among those connected with the project are W. B. Rankin, the president of the Canadian Niagara Power company; H. P. Coburn, Sawyer-Massey Co., Hamilton; J. H. Tilden, of the Gurney-Tilden Co., Hamilton; J. H. Jewell and H. H. Dewart, Toronto, and a number of Buffalo and New York men.

Mr. C. Morris, late mine superintendent at Blairmore, Alta., has left on a visit to his old home in Glenmorganshire, Wales. Mr. Morris is the pioneer mine superintendent of the district, he having had charge of the mines at Frank up to the time of the great rock slide and after that took charge of the mines at Blairmore.

Mr. A. L. Dean, formerly superintendent of the Canadian Smelting Works, at Trail, has left Victoria for Tasmania, having been appointed metallurgist at the Mt. Lyell Mining & Railway Co.'s smelter on the west coast of Tasmania.

Mr. H. T. Pemberton, of Boundary Falls, B.C., was in Montreal recently on a visit to the head office of the Montreal & Boston Co., of which company he is the business manager at the mines.

Mr. Charles Dempster a leading mining promoter of Rossland, B.C. who was recently on a visit to the Dominion capital on business connected with several mining propositions in which he is interested, has returned to his western home. Mr. Dempster now informs his Rossland friends that while in the east he noted an appreciably better feeling towards mining investments in the western province.

Mr. Ronald Harris, a mining engineer well known in the Kootenays, but who now makes his headquarters in London, England, has returned home after a short visit to British Columbia. It is about three years since Mr. Harris left Southern British Columbia to go to West Africa for an English syndicate composed of the Tarbutts and Harrison and Barchard, the erstwhile owners of the B.C. mine in the Boundary. He has spent most of his time since then between the Gold Coast and London.

It is stated that Mr. Andrew Laidlaw, well known in Rossland and Boundary as the original promoter of the Boundary Falls smelter proposition, has closed a deal with Montreal capitalists for the sale of valuable coal lands on Fording river in East Kootenay.

Mr. J. H. Plummer and Mr. William McMaster, Directors of the Dominion Iron and Steel Co. were in Ottawa, on 28th, conferring with the Minister of Finance, in matters concerning the operations of the company.

## CENTRE STAR.

### Manager Kirby's Fifth Annual Report Much Better Reading than its Predecessors.

We print below an extract from the Fifth Annual Report of the Directors' of the Centre Star Mining Company, to which editorial reference is made in this issue:—

**EXPLANATORY NOTE:** The values given are based upon the price of 12 cents for copper instead of 16.25 cents, as in previous reports.

It is the usual practice of mines in pricing and recording ore to use the "FULL ASSAY VALUE" instead of the "SMELTER'S GROSS ASSAY VALUE" which is less. While this plan is often preferable it has so far been more convenient at the Centre Star Mine to use the latter value, which as shown by the table opposite, has on shipping grades ranged from \$2.47 to \$3.93 less than the Full Assay Value.

Developments up to date show that the Centre Star Mine has experienced the same general change in the character of its ore deposits which has occurred in all other productive mines of the Rossland District, and which is the general rule throughout the mining districts of the world. This is the transition from the occurrence of high grade bonanza ore bodies, capable of profit under the expensive process of smelting, to masses of lower grade, requiring a cheaper treatment by milling.

As the bodies of smelting ore in the vein become less frequent and their average size diminishes, the proportion of this ore to the increasing quantity of development or dead work required to expose it rapidly lessens to a point where its profit is consumed by the cost of the dead work. The relief to be derived from milling will therefore be not only in the direct saving of cost expected, but also in the increased proportion of pay ore to development work, while the stoping of low grade blocks will assist the exploration work by disclosing the unknown bodies of smelting ore contained within their limits.

The ore sales during the year have been 88,387 tons, averaging \$10.58 smelter's gross assay value. The average assay contents were: Gold, 0.50 oz.; Silver, 0.40 oz.; Copper, 0.99%. The net profit in excess of all expenditure was \$228,358.90, which has covered the indebtedness of the Company and left a surplus of \$88,157.12 in the treasury. The reserves of smelting ore at the present moment are not large, and are of such shape that their dimensions cannot be accurately estimated.

The development work of the year has continued to add to the great masses of ore too low in grade for smelting, but rich enough to afford a profit to successful milling. Now that the mill of The Rossland Power Company assures an outlet for these ores within a few months, their contents will soon be available. It is impossible to present any reliable estimate of their quantity or precise value, because their limits have not been defined, and until milling begins they cannot be exposed and sampled accurately without excessive expense. They occur in extensive bodies 15 to 30 feet in width, and exposed very imperfectly by the mine workings, since these have in the past been directed to the exposure of smelting ore bodies only.

#### DETAILS OF DEVELOPMENT.

*Fourth Level.*—(431 feet in depth measured on the vein).

The fourth level east has been extended to a point 690 feet from the shaft. From the 340 to the 400 foot point, no values. At the 400 foot point a cross-cut shows the ore to be 10 feet in width, averaging \$3.45 smelter's gross assay value. From the 400 to the 470 foot point the ore averaged \$4.40 smelter's gross assay value. From the 470 to the 500 foot point the ore averaged \$14.70 smelter's gross assay value. From the 500 to the 680 foot point the average is \$6.20 smelter's gross assay value, at the 500 foot point the ore is 35 feet wide, averaging \$5.00 smelter's gross assay value.

*Fifth Level.*—(608 feet in depth measured on the vein).

In the fifth level west at a point 65 feet west of the shaft crosscut winze No. 583 has been sunk 65 feet on the vein, in ore averaging \$3.60 smelter's gross assay value. From the bottom of the winze 45 feet of headings have been driven, showing no values. At the 340 foot point raise No. 595 has been made on the vein to connect with the fourth level. For the first 50 feet there were no values. From the 50 to the 70 foot point the ore streak widens from 18 inches to 10 feet, averaging \$3.80 smelter's gross assay values. From the 70 to the 100 foot point the vein is 18 feet wide, but low grade. From the 100 to the 175 foot point the ore averages \$4.70 smelter's gross assay value. Seventy feet above the level an intermediate drift has been driven 75 feet west along the vein. The ore has been exposed for a width of 12 feet, averaging \$4.00 smelter's gross assay value.

The fifth level east has been extended to a point 358 feet from the shaft crosscut. From the 187 to the 217 foot point the ore is 8 feet wide, averaging



\$9.80 smelter's gross assay value. From the 217 to the 358 foot point, no values.

*Sixth Level.*—(778 feet in depth measured on the vein).

The main level east has been extended to a point 1,060 feet from the shaft crosscut. At the 934 foot point an ore body begins 20 to 30 feet in width, and averaging \$20.00 smelter's gross assay value. At the 985 foot point the vein is shown in a crosscut to be 28 feet in width, and heavily mineralized; 15 feet of this width averaging \$16.00 smelter's gross assay value, and the remaining 13 feet averaging \$3.50 smelter's gross assay value. To the 1,030 point the ore is low grade. From the 1,030 ft. to the 1,060 ft. point the ore is 15 to 20 feet wide, averaging \$6.00 smelter's gross assay value. At the 945 foot point, winze No. 618 has been sunk 14 feet on the vein, showing ore of low grade.

*Seventh Level.*—(924 feet in depth measured on the vein).

The main level east has been advanced from the 398 foot point to a point 615 feet from the shaft crosscut. The vein is shown by several crosscuts to be 15 to 20 feet wide, and heavily mineralized, but of low grade.

*Eighth Level.*—(1,077 feet in depth measured on the vein).

The main level west has reached a point 285 feet from the shaft crosscut.

The vein is heavily mineralized but of no value except from the 27 to the 64 foot point, where it averaged \$14.80 smelter's gross assay value.

The main level east has reached a point 425 feet from the shaft crosscut.

The vein is heavily mineralized, but of no value.

*Ninth Level.*—(1,222 feet in depth measured on the vein).

At the point of intersection by the shaft crosscut the vein is heavily mineralized, and 47 feet in width, but of low grade.

The ninth level west on the hanging side of the vein has reached a point 109 feet from the shaft crosscut, no values. A heading on the foot wall side advanced 17½ feet through heavily mineralized ore, averaging \$3.95 smelters gross assay value.

Ninth level east on hanging side of the vein has advanced 114 feet, exposing heavy sulphides of no value. On the foot wall side a heading has been driven 20 feet through ore averaging \$3.65 smelter's gross assay value.

#### GENERAL REMARKS.

The necessity for milling has long been foreseen, but although every effort has been made towards the desired end, there has been unexpected delay, owing to unusual difficulties and obstacles. The technical problem presented by the nature of the ore has been a serious one, and the business arrangements necessary for success has also taken time. A satisfactory method of treatment was devised some time ago, while the questions of location, water supply, land, freight rates, market for product, and the financing of the milling enterprise were finally settled last August.

The serious obstacle presented to large scale milling by the so-called 2% tax imposed by the British Columbia Government upon the gross-product of mines has not yet been removed. This tax has the peculiar effect of exacting an increasing proportion of the net profits as the grade of ore lowers. For instance, on the milling grades of the Centre Star and other Rossland mines it will take anywhere from 10 to 20% of the net profits, which greatly increases the difficulty of securing capital for milling operations. The disastrous effect of this tax in repressing the mining and milling of low grade ores throughout the Province has forced the mining communities to join in active measures for its repeal, and the matter is being steadily pressed by the Provincial Mining Association. It is believed that the new Legislature will not longer delay the relief so urgently demanded by popular sentiment.

A preliminary mill of 200 tons daily capacity, but designed for prompt enlargement to 400 tons, is now being built by The Rossland Power Company, Limited, and is located upon the line of the Canadian Pacific Railway near the town of Trail. It is expected to begin operations by early spring, affording the desired outlet for the milling ores of the Centre Star and War Eagle mines.

It is proper to call special attention to the reduction effected during the past year in the costs of mining, which have lowered all previous records. The figures are as follows:

|                               |                   |
|-------------------------------|-------------------|
| Winzes, - - - - -             | \$38 77 per foot. |
| Raises, - - - - -             | 29 97 "           |
| Drifts, - - - - -             | 17 09 "           |
| Mining ore from stopes, - - - | 2 07 per ton.     |

The entire cost of mining and delivering ore on the cars, including its pro rata of general expenses, was \$2.07 per ton of ore from the stopes, and during several months ranged between \$1.93 and \$1.96. Including the additional ore broken by development headings, the average for the year was

\$1.97 (see table of costs). These figures would be satisfactory in most mining districts of the west, but in view of the extreme toughness of this ore and rock, the moderate rate of output and the severe conditions of mining here, they are very exceptional.

#### TABLE OF MINE COSTS.

Twelve Months ending September 30th, 1903.

|                                                 | DEVELOPMENT WORK.          |                              |                   |                   | ORE EXTRACT-<br>TION. |
|-------------------------------------------------|----------------------------|------------------------------|-------------------|-------------------|-----------------------|
|                                                 | SINKING.<br>Main<br>Shaft. | SINKING.<br>Small<br>Shafts. | RAISING.          | DRIFTING          |                       |
| Total Advanced, feet. ....                      |                            | 79.                          | 186.              | 2,903.5           |                       |
| Ore Stopped, tons. ....                         |                            |                              |                   |                   | 84,453.               |
|                                                 | Cost<br>Per Foot.          | Cost<br>Per Foot.            | Cost<br>Per Foot. | Cost<br>Per Foot. | Cost<br>Per Ton.      |
| 1. Drilling. ....                               |                            | \$6 10                       | \$7 31            | \$4 53            | 40.5                  |
| 2. Blasting. ....                               |                            | 2 48                         | 2 40              | 1 08              | 03                    |
| 3. Explosives. ....                             |                            | 3 13                         | 3 72              | 2 72              | 14.5                  |
| 4. General Mine Supplies. ....                  |                            | 51                           | 64                | 43                | 64                    |
| 5. Mine Lighting—Candles. ....                  |                            | 26                           | 19                | 14                | 01.5                  |
| 6. " " Electric. ....                           |                            | 30                           | 22                | 13                | 01                    |
| 7. Smithing. ....                               |                            | 1 00                         | 1 14              | 72                | 06.5                  |
| 8. Tramming & Shovelling—<br>Direct. ....       |                            | 5 51                         | 65                | 1 21              | 24                    |
| 9. Tramming & Shovelling—<br>Apportioned. ....  |                            | 64                           | 35                | 42                | 08.5                  |
| 10. Timbering—Labor. ....                       |                            | 1 81                         | 3 08              | 02                | 19                    |
| 11. " " Material. ....                          |                            | 33                           | 57                | 01                | 11                    |
| 12. Machine Drill Fittings and<br>Repairs. .... |                            | 86                           | 94                | 60                | 05.5                  |
| 13. General Mine Labor. ....                    |                            | 1 57                         | 1 18              | 84                | 09                    |
| 14. Hoisting—Underground. ....                  |                            | 4 79                         |                   |                   |                       |
| 15. " " Main Shaft. ....                        |                            | 1 48                         | 89                | 94                | 19                    |
| 16. Compressed Air. ....                        |                            | 1 74                         | 2 08              | 1 07              | 12                    |
| 17. Mine Ventilation. ....                      |                            | 23                           | 17                | 13                | 01.5                  |
| 18. Pumping. ....                               |                            | 1 71                         | 1 09              | 34                | 03.5                  |
| 19. Assaying. ....                              |                            | 55                           | 47                | 14                | 03                    |
| 20. Surveying. ....                             |                            | 20                           | 17                | 11                | 01                    |
| 21. General Expense. ....                       |                            | 3 57                         | 2 71              | 1 51              | 18.5                  |
| Total. ....                                     |                            | 38 77                        | 29 97             | 17 09             | 2 06.5                |

#### ORE SOLD.

Stopped. .... 84,453 tons.

Met in Development. .... 3,934 "

Total. .... 88,387 "

#### TOTAL HEADING OF CENTRE STAR MINE.

September 30th, 1903.

|                                                                   | SINKING        |         | RAISING | DRIFTING |
|-------------------------------------------------------------------|----------------|---------|---------|----------|
|                                                                   | Main<br>Shaft. | Winzes. |         |          |
|                                                                   | Feet           | Feet.   | Feet.   | Feet.    |
| Total Headings of Mine, Sept.<br>30, 1902. ....                   | 1,289.5        | 1,693.5 | 1,994.5 | 15,286.5 |
| Advance of Headings, Oct, 1st,<br>1902, to Sept, 30th, 1903. .... |                | 79.     | 186.    | 2,903.5  |
| Total Headings of Mine,<br>Sept. 30th, 1903. ....                 | 1,289.5        | 1,772.5 | 2,180.5 | 18,190.  |

Rossland-Kootenay Mining.—The report of the directors of the Rossland-Kootenay Mining Company, Limited, to be submitted at the meeting to be held on Monday next, states that the debit balance of profit and loss account, £6,572, is mainly owing to the fact that the directors have decided to charge that account with the following items:—Proportion of mine development account; depreciation of buildings, plant, machinery, etc.; reserve for contingent expenses and legal charges in re Centre Star Mining Company suit. Owing to the irregular manner in which the values occur in the ore it has been found very difficult to determine the tonnage and value of the ore in reserve, and eventually it was decided that the only efficient way of setting the matter was by the shipment of substantial tonnage of ore. Accordingly some 5,000 tons have been shipped, and realised at rates showing a profit over the cost of production. Now that the directors possess accurate knowledge as to the positions and values of the various bodies of ore available, the shipment and realisation of the latter can be affected with the maximum of benefit to the company. During the period covered by the accounts, shipments have been necessarily limited to three and a half months, but these will now be pressed forward, and the directors have every hope that vigorous diamond-drill prospecting in the lower levels will materially add to the reserves of high-grade ore.



## OGILVIE GOLD DREDGING CO.

### Mr. Wm. Ogilvie's First Report to the Shareholders Disappointing.—Another Dredge Recommended.

The following report, under date of 9th, December, has been issued to shareholders in the Ogilvie Gold Dredging Company. The company operates on an extensive leasehold of dredging property on the Stewart River, Y.T. A description of the dredge which was designed by Mr. A. W. Robinson, an experienced dredging engineer of Montreal, was fully described in the March issue of the REVIEW:—

"I submit for your information the following brief resume of the operations of this Company during the past season. I regret the delay in presenting it, and plead in extenuation the non-arrival of the assay returns of the last deposit of gold dust with the Canadian Bank of Commerce at White Horse. This by the way has not reached me yet, but I deem it advisable not to wait any longer, though my report is incomplete without it.

During the last few hours' operations of our dredge last year, (in the fall of 1902) it was found that certain changes and additions would have to be made to suit more efficiently the conditions found. Material and parts suitable to the end in view were ordered in ample time for their arrival at White Horse early in April, but for some occult reason the parties favored with the order did not see fit to ship the bulk of it until the month of June, and we received it when most of the working season was gone.

Mr. Morley Ogilvie, with three men, and two heavily loaded canoes, left White Horse for the dredge on May 12th, but Lake Labarge, and the river below, being still covered with ice, their journey was so much hindered that it was the 28th when they reached the machine. I followed immediately after the lake opened to navigation, and reached the party on June 25th.

The dredge had wintered safely, and the men left in charge during the past winter had cut enough wood to run it all season. Work was commenced on it at once, and in a few days it was running, and a start was made to test as much of the Company's property as possible during the remaining portion of the season.

Our season's operations were much hindered, and the results lessened by—1st, the want of material ordered as mentioned, which was not available for use until within six weeks of the close of the season; 2nd, the unusually high state of water during all June and a good part of July; 3rd, the very low stage of water during the latter part of August and all September, this condition of the water hindered us from moving from place to place to a considerable extent, but in fairness it must be said that the first cause did more than all the others, times over, while we suffered the full effect of the second, because of the want of the material already referred to.

During the season a log or diary was kept, in which anything of note connected with the work was entered, and from this it is possible to make an estimate of the season's operations.

Our machine was supposed to lift 1,000 cubic yards of gravel in 24 hours, this being about 42 yards per hour. As a matter of fact it was found that, during the operations of prospecting, it only handled an average of about 30 yards, or 720 yards per 24 hours, this being slightly over 70% of the supposed capacity. In reviewing the situation, it may be said, though the season is not the success we hoped it would be, for the reasons mentioned, and as much time and delay was attendant on the work of prospecting, yet the results, we think, amply justify the Directors in seriously considering the desirability of building another dredge for next year's operations, but this time it should be a large one, not less than 3,000 cubic yards' capacity per day, which, in practice, will handle readily from 2,000 to 2,500 yards per day. The same crew run the larger one, the only difference will be the extra fuel and oil. The dredge depth of the present machine was not more than 25 feet below the surface of the water, and at only a few places was this depth attained, and in no place was bedrock reached. I consider that the next dredge should be capable of dredging to a depth of not less than 40 feet from the surface of the water.

**Results.**—Many miles of the river were prospected, and considerable time was given to the most notable locations, but some of the prospects were found only on the surface. It will be sufficient for the purpose of this report to to indicate briefly the work done on one of these locations, and the results that can be achieved by the continuation of the operations. The figures quoted may be regarded as about a fair average, as much richer ground has been found in this locality. The pay was found from seven to nine feet below the surface of the gravel, but what the thickness of the pay stratum is

could not very well be determined, but it was deep enough and rich enough, when mixed with non-pay dirt above, to pay even with our small prospecting machine.

Here, after 42 hours work, out of which the dredge worked 34 hours and lifted 1,395 yards, I made a clean-up and got 25.1023 ozs., of amalgam, which is worth \$6.50 per oz., aggregating \$163.16, which, divided by the time, gives \$4.72 per hour. An examination has pretty well satisfied me that our living and operating expenses for the eight men at present engaged, including wood, board, oil, etc., will total \$2.24 per hour, leaving a balance in this particular case of \$2.48 per hour, which, in the 24 hours, would make the working expenses \$53.76. But this is not a fair statement of the case in this instance, for in this work we had to lift a lot of tailings made in a previous test, which increased our work and did not add anything to our receipts on this occasion. These tailings amounted to not less than 400 yards, from which good pay has already been taken. As the hourly lift for the time was a fraction of over 40 yards, if the tailings are converted into time they mean ten hours, leaving 24 hours effective work, which would average \$6.66 per hour, which gives a balance of \$4.42 per hour; this in 28 makes \$88.40, the working expenses remaining the same. In the season of 140 days the aggregate profit would be \$12,376.00 with the present dredge. In such ground a dredge of 3,000 yards capacity would give 2½ times as much with an increase in cost of only one item, wood, and assuming that the consumption of that would be doubled in the larger dredge it would make the hourly expenses \$2.93 while the output in such ground as that quoted would be increased to \$16.66 or at only 20 hours per day, \$333.33, while the expenses for 24 hours would stand at \$70.32, add 10% of this, if you like, for breakage, wear and tear, etc., and it stands \$77.35 and we have a daily balance of \$256.00 and for the season of 140 days a total of \$35,849.00, you may cut this in two if you like and still have a handsome profit on the money invested. At this particular location there is ground enough, I think, to keep a dredge a season, and I am quite satisfied that we will find in our leases many, many such places, some of them richer than the one above described.

## NEW COMPANIES.

### ONTARIO.

**The Crowland Natural Gas Company, Limited.**—Incorporated under the Statutes of Ontario, 4th November, 1903. Authorized capital, \$80,000, in 1,600 shares of \$50.00 each. Directors: J. H. Smith, T. F. White, J. H. Pew. Head office, Port Colborne, Ont. Formed to acquire the properties known as "The Crowland Natural Gas Company, Limited."

**The Mikado Gold Mining Company, (1903) Limited.**—Incorporated under the laws of the Imperial Parliament of the United Kingdom of Great Britain and Ireland, and licensed under the Statutes of Ontario, 6th November, 1903. Authorized capital for use in Ontario, \$175,000. W. Davidson, Toronto, Ont., attorney. Formed to acquire the properties known as "The Mikado Gold Mining Company, (1903) Limited."

**The Damascus Gold Mining Company, Limited.**—Incorporated under the Statutes of Ontario, 13th November, 1903. Authorized capital, \$250,000, in 250,000 shares of \$1.00 each. Directors, J. S. Lovell, W. Bain, R. Gowans, E. W. McNeill, R. Richardson. Head office, Bridgeburg, Ont. Formed to acquire the properties known as "The Damascus Gold Mining Company, Limited."

**The Grimsthorpe Mining Company, Limited.**—Incorporated under the Statutes of Ontario, 20th November, 1903. Authorized capital, \$150,000, in 1,500 shares of \$100.00 each. Directors, G. G. S. Lindsey F. Landenberger, Cora Anne Lindsey, W. B. Northup, W. R. Wadsworth. Head office, Toronto Ont. Formed to acquire the properties known as "The Grimsthorpe Mining Company, Limited."

**The Toronto Iron and Steel Company, Limited.**—Incorporated under the Statutes of Ontario 13th November, 1903. Authorized capital, \$40,000, in 400 shares of \$100.00 each. Directors, D. Muhlfelder, W. E. Friedman, R. E. Mills. Head office, Toronto, Ont. Formed to acquire the properties known as "The Toronto Iron and Steel Company, Limited."

**The International Iron Mining Company, Limited.**—Incorporated under the Statutes of Ontario, 29th October, 1903. Authorized capital, \$1,000,000, in 10,000 shares of \$100.00 each. Directors, J. F. McCarthy, L. Merritt, J. T. Hickman, H. R. Spencer, T. A. Merritt. Head office, Port Arthur, Ont. Formed to acquire the properties known as "The International Iron Mining Company, Limited."

**The Canadian Consolidated Oil Company, Limited.**—Incorporated under the Statutes of Ontario, 27th November, 1903. Authorized capital, \$1,000,000, in 10,000 shares of \$100.00 each. Directors, E. R. Clarkson, T. Ramsay, J. Dixon, L. Bauer, H. P. Coburn. Head office, Hamilton, Ont.

### BRITISH COLUMBIA.

**The Great Northern Mines, Limited.**—Incorporated under the Statutes of British Columbia, 7th November, 1903. Authorized capital, \$1,500,000, in 1,500,000 shares of one dollar (\$1) each. Formed to acquire the properties known as "The Great Northern Mines, Limited."



**The Perry Creek Gold Mining Company, Limited.**—Incorporated under the Statutes of British Columbia, 10th November, 1903. Authorized capital, \$500,000, in 500,000 shares of one dollar (\$1) each. Formed to acquire the properties known as "The Perry Creek Gold Mining Company, Limited."

**The Princess Royal Gold Mines, Limited.**—Incorporated under the Statutes of British Columbia, 24th November, 1903, as an Extra-Provincial Company. Authorized capital, \$1,250,000, in 1,250,000 shares of one dollar (\$1) each. Head office, Rothesay, Kings Co. N.B. Head office in British Columbia, Victoria, B.C. D. M. Eberts, Victoria, B.C., attorney. Formed to acquire the properties known as "The Princess Royal Gold mines, Limited."

**The Lardeau-Duncan Mines, Limited.**—Incorporated under the Statutes of British Columbia, 7th December, 1903. Authorized capital, \$150,000, in 1,500,000 shares of ten cents (10c.) each. Formed to acquire the properties known as "The Lardeau-Duncan Mines, Limited."

**The Idaho-Alamo Consolidated Mines, Limited.**—Incorporated under Statutes of British Columbia, 7th December, 1903, as an Extra-Provincial Company. Authorized capital, £130,000 in 130,000 shares of £1. each. Head office, Scotland. Head office in this Province, Alamo, B.C. W. S. Jenkins, Alamo, B.C., attorney. Formed to acquire the properties known as "The Idaho-Alamo Consolidated Mines, Limited."

## COMPANY NOTES.

**Hastings, (B.C.) Exploration.**—During the month of November 65 tons of ore were shipped from the Arlington Mine (Erie) for which the smelter returns amounted to \$2,419.54. The expenses for the month were \$3,427.13 showing a loss on the month's operations of \$1,007.59. Owing to the changeable weather the roads were unfit for hauling and shipments were discontinued the 9th of the month, but the orebins are full and shipping will be resumed as soon as sufficient snow falls to make good roads. Of the operations during the past financial year of this Company, of which reference is made elsewhere in this issue, the following is taken from the Directors, report to the shareholders. With regard to the Arlington Mine, the Directors informed the shareholders at the last general meeting, that Mr. Hill, the Company's local manager and engineer, having advised there was very little pay ore in sight, instructions were issued to shut down the mine except so far as taking out that payable ore. They are, however, now able to state that owing to subsequent discoveries the mine has more than paid expenses during the past twelve months.

**Tyee Copper.**—Smelter, Cable gives results of smelting for 29 days of November: "Smelted—Tyee ore, 4,830 tons; Customs ore, 1,510 tons—6,340 tons. Matte produced from same, 700 tons. Gross value of contents (copper, silver, and gold), after allowing for costs of refining and purchase of Customs ore, \$65,735. N.B.—It is anticipated that the smelter will be shut down for about 20 days during the current month, for the usual repairs, and till the completion of the aerial ropeway." The circular adds:—Mine—"The following figures are taken from the mine superintendent's monthly reports of work done from April last to end of October, inclusive:—East drift, No. 1 (100 ft. level), 284½ ft.; crosscut north No. 6 (100 ft. level), 38 ft.; crosscut north No. 7 (100 ft. level), 96 ft.; crosscut No. 8 (100 ft. level), 11 ft.; upraise No. 3 (100 ft. level), 88 ft.; east drift No. 1 (165 ft. level), 180 ft.; crosscut north No. 1 (165 ft. level), 6ft.; crosscut north No. 2 (165 ft. level), 52 ft.; crosscut north No. 3 (165 ft. level), 152 ft.; crosscut north No. 4 (165 ft. level), 28 ft.; crosscut from upraise No. 3 (165 ft. level), 23 ft.; upraise from crosscut No. 4 (165 ft. level), 35 ft.; upraise No. 2 (165 ft. level), 25 ft.; crosscut from upraise No. 2 (165 ft. level), 20 ft.; east drift No. 1 (300 ft. level), 606½ ft.; upraise No. 1 (300 ft. level), 23 ft. Total, 1,668 ft. Aerial ropeway.—The work of carrying out the doubling of the capacity of the aerial tramway is in an advanced stage, and it is anticipated will be completed by about the middle of December. As soon as this is finished, it will ensure a more ample supply of ore to the smelter, and increased returns. Water.—The pumping station at the Chemainus River has been completed, and is supplying the mine with sufficient water for all purposes."

**Anglo-Klondyke Mining.**—the directors, in their report for the year ended September 30 last, state that the amount of available net profit (including a balance of £3,808 brought forward from last year) is £12,509, from which the directors recommend the declaration of a dividend of 10 per cent. (free of income-tax) on the ordinary shares, payable to all shareholders registered on November 30. This will absorb £12,329, leaving a balance of £180 to be carried forward to the next account. In view of the very heavy amounts that have been written off in previous years for depreciation, the directors are of opinion that it is unnecessary to write off anything further under that head on this occasion, and, considering the large cash balance (£27,921), they feel that they are consulting the shareholders' interests in dividing the profits close up, as, after payment of the above-mentioned dividend, there will still be an available cash balance of £15,591.

**British Columbia (Rossland and Slocan) Syndicate.**—The report of the British Columbia (Rossland and Slocan) Syndicate for 1902, to be presented at the meeting on the 23rd inst., states that the Snowshoe mine at Phoenix, owned by the Snowshoe Gold and Copper Mines, Ltd., in which this syndicate is the largest shareholder, has during the year been further extensively developed. Its development has shown up large bodies of ore, and during the year under consideration about 20,000 tons of ore have been shipped to the local smelters. Additional machinery has been installed, and shipments upon an increased scale have since been steadily maintained. The directors have been considering how best to develop some of the other properties owned by the syndicate, or to acquire interests capable of development in such a manner as to yield substantial profit, and in this connection considerable work has been done in various directions, which it is hoped it may be possible to turn to profitable account, as was done in the case of the Snowshoe. Many business proposals, some industrial and some for railway

construction under Government charters, have been put before the directors and investigated, and one or two of these are being further looked into on the spot. The profit and loss account shows a balance of £63, after writing off depreciation on furniture, office, expenses, directors' and auditor's fees, etc. The reserve fund consists of 79,000 shares in the Snowshoe Gold and Copper Mines, Ltd., valued at £79,000. The nominal capital of the company is £100,000, and of this amount at 31st December last 90,000 shares were issued. Of these 76,648 shares were fully paid, and 13,352 were 12s. 6d. paid, leaving a balance of 10,000 shares unissued.

**Brookfield Mining (Nova Scotia).**—Cablegram from the company's fiscal agents in Boston, U.S.A.:—"700 (tons ore) crushed during last month (yielded) 450 ozs. (gold). Mine looking much better than we expected. Ore is increasing in quantity and improving in quality. Cyanide process has been successful." (Office note.—The above yield of gold—value nearly \$9,000—shows a very large increase over previous returns.)

**Ymir.**—The mine manager reports the return for the month of October, 1903, by cable, as follows:—Sixty-five stamps ran 30 days, and crushed 5,500 tons (2,000 lb.) of ore, producing 937 oz. bullion. The estimated realisable value (gross) of the product is \$10,250; 305 tons of concentrates, shipped, gross estimated value, \$7,750; cyanide plant treated 2,650 tons (2,000 lb.) of tailings producing bullion having estimated gross value of \$1,950; sundry revenue, \$437—\$20,387; working expenses, \$24,250; loss, \$3,863. There has been expended during month on development, \$4,250.

**Velvet.**—The secretary has issued copies of a letter, dated 23rd October, from Mr. Allan Maclean, who has just returned from British Columbia, and is a director of the company. Mr. Mclean says:—"After carefully considering the adaptability of the smelting plants inspected in Mexico and elsewhere, we became thoroughly convinced that a small pyrite smelting plant, with a capacity up to 100 tons per day, would be most suitable to treat the ores of the Velvet and Portland mines, and the knowledge gained by our investigations will enable the company to erect a very suitable plant at a moderate cost. The copper values shown in the Velvet and Portland mines by recent assays will be of great assistance in collecting the gold and silver contained in the ore, and no great difficulty should be experienced in securing a ratio of concentration of 20 to 1; that is, for each 20 tons of ore fed into the furnace, one ton of matte, containing the gold, silver, and copper contents should be produced. Had we been in a position to treat at the mine by concentration or pyritic smelting, the ore shipped during the past year, there would have been a saving, in the freight and treatment charges, amounting to nearly \$40,000. On account of the probable results to be gained, and the splendid equipment that the mine has for carrying on the further development work, I consider that it would be suicidal to abandon or to close it down. The suggestions made by Mr. William Thompson in his report (copies of which have also been issued) should, in my opinion, be carried out. To effect these, and in view of the position and trend of the ore bodies, an amalgamation of the Portland and Velvet mines would be mutually advantageous. At the same time I would suggest that the combined capital of the two companies be reduced to a sum upon which dividends could, with reasonable hope, be paid, when the concentration and smelting plants, now recommended, are in full operation."

**Le Roi.**—Cable from the manager: "Shipped from the mine to the Northport smelter during the past month 16,045 tons of ore, containing 5,305 ozs. of gold, 7,460 ozs. of silver, and 349,600 lbs. of copper. Has resulted in a loss of \$1,150, according to the usual calculations. Shipped from the dump to the Northport smelter during the past month 869 tons of ore, containing 187 ozs. of gold, 222 ozs. of silver, and 12,300 lbs. of copper. Estimated profit on this ore, \$550. Development work, 1,350 level—Have driven crosscut 123 ft. during the past month and have drifted 123 ft. on south vein. The ground through which we are now driving is somewhat encouraging, being well mineralised, but the grade of the ore is very variable. Have already shipped a small number of tons of ore from this work. (Office note.—The losses cabled in the last few months have been mainly due to necessary exploration work in the mine, considerable in amount, and charged, as usual, against the estimated profits on ore extracted.)

**The Cape Breton Coal & Iron Co.**—This company which was recently incorporated with an authorized capital of \$3,000,000, is being promoted by Iowa parties, who have opened an office at Des Moines. N. E. Coffin, a member of a law firm of that city, is president of the concern, and others interested are H. J. Deards, H. H. Reynolds, Charles Crane, J. M. Goodson, and other local professional and business men. It is stated that possession has been acquired of a 25,000-acre tract of land in Cape Breton, of which 16,000 acres are known to contain coal deposits, and the officers of the company are now endeavoring to dispose of enough of the stock to begin development work at an early date.

**The Cumberland Ry. & Coal Co.**—That Spring Hill, N. S., strike was short lived. After a week's idleness of 1,600 men, the outcome of the difficulty is a virtual victory for the management, as the new scale of measurement of coal cut will be considered in effect since December 1. It was the change of measurement which precipitated the strike, but after a conference with the management the new scale was accepted, and the men were ordered to return to work. We have seen the pay-rolls of men employed by this company and must say that with the earnings made, there should be no shirking of work; the average is better than many Canadian professional men are in receipt of.—Coal Trade Journal.

**Dominion Coal Co.**—The output of the Dominion Coal Co.'s collieries for the month of November shows a slight decrease over the output of the previous month. This is accounted for by the fact that in November there was one less working day, and also that the International mine, Bridgeport, is working one shift only. The breaking of a shaft at Caledonia also caused a decrease. The output from Dominion No. 1 mine is increasing well. Total output for November was 271,247 tons. Austin King, the new superintendent of mines, has arrived and has assumed charge.

**Nova Scotia Steel & Coal Co.**—The output from the mines of this company for the month of November show a decrease as compared with the month of October. This is accounted for by a falling off in the trade during



the latter part of the month, when they discontinued the night shift. Sydney No. 4 mine, strange to say, raised more coal by the single shift than was done during the early part of the summer, when the mine was worked night and day. The output was 45,977 tons. This is a decrease of 3,760 tons against October's output. At an early date the company is likely to purchase valuable and extensive iron deposits in Cuba. They have already secured options on several properties there, and R. E. Chambers, chief mining engineer of the company, is now on the way to Cuba to examine and report on the properties. Cuban ore is already largely used by this company to mix with ore from Belle Isle, Nfld., making the best quality of iron.

**Crow's Nest Pass Coal Co.**—The output of the Crow's Nest Pass collieries for the week ending December 18, was 20,397 tons; Coal Creek, 7490 tons; Michel, 8177 tons; Morrissey, 4730 tons; total output for the week, 20,397 tons; average daily output, 3400; total output for corresponding week last year, 11,032 tons, average daily output corresponding week last year, 1838 tons.

**B.C. (Rossland and Slocan) Syndicate.**—The ordinary general meeting of this company was recently held in London, Eng. The proceedings were brief, as Messrs. J. McMillan and Geo. S. Waterlow, both directors, not having returned from their visit to British Columbia at the time. The syndicate floated the Snowshoe mine during the year, retaining 116,000 shares of the stock, which was described by the chairman as a valuable asset. Klondyke claims held by the syndicate had not substantiated the hopes entertained for success and had been abandoned during the year.

**The Lake Superior Consolidated.**—The assets of the Consolidated Lake Superior Company held by Speyer & Co. for a loan of \$5,050,000, were bought in at a public auction by Speyer & Co., on the 15th inst. for \$4,500,000. Theirs was the only bid. The sale was held in spite of several protests by representatives of other creditors. The sale took place in the presence of a large crowd, which included former President Clergue of the Consolidated Lake Superior Company.

**The Nova Scotia Steel and Coal Co.**—The directors of the Nova Scotia Steel and Coal Co. met in New Glasgow, Dec. 21st, to consider the result of the year's operations. The coal output for the present year at Sydney Mines was shown to be in round figures eighty per cent. in excess of last year's yield, and the output of the Marsh Mine, near New Glasgow, 75 per cent. greater than the previous year. Two new colliers started at Sydney Mines have been brought up to the producing stage, and although not fully complete or anything like up to their maximum capacity, they produced one hundred thousand tons during the year. This company is the second largest producer of coal in the province, and it is estimated that 700,000 tons of coal will be raised next year. These figures came as somewhat of a surprise to the public, as it was not thought that the company was developing its very extensive coal fields to this extent. The increase in pig iron and steel was shown to be very considerable, and the output of ingots and finished steel considerably larger than in any previous year. The matter of increased dividend was not considered, and will not be till February next, as the dividend in the common stock is not payable till March 15th.

## CONCENTRATES.

Shipments of ore from the Rossland camp for the week ending December 12, and for the year to date, in tons, are as follows:

|                            | Week  | Year    |
|----------------------------|-------|---------|
| Le Roi.....                | 5,760 | 208,180 |
| Centre Star.....           | 1,500 | 75,526  |
| War Eagle.....             | 1,290 | 56,688  |
| Le Roi No. 2.....          | 410   | 24,915  |
| Le Roi No. 2 (milled)..... | 350   | 2,100   |
| Jumbo.....                 | 120   | 3,853   |
| Spitzee.....               | 60    | 480     |
| I. X. L. (milled).....     |       | 1,760   |
| Kootenay.....              |       | 6,798   |
| Giant.....                 |       | 830     |
| Iron Horse.....            |       | 40      |
| Velvet.....                |       | 3,376   |
| White Bear.....            |       | 297     |
| O. K.....                  |       | 25      |
| Homestake.....             |       | 90      |
| Totals.....                | 9,690 | 385,785 |

The most notable international gathering of engineers ever held in the United States, if not in the world, will take place in October, 1904, when a World's Engineering Congress is to be held at St. Louis, in connection with the great exposition. As already announced, the Iron and Steel Institute is to visit this country next year, and will hold meetings here in conjunction with the American Institute of Mining Engineers. A more remarkable event is forecasted in the announcement that the Institution of Civil Engineers is to visit the United States next year. This society has not only never before held a meeting in a foreign country, but, so far, has never held a formal meeting in England outside of London.

The shipments of coal by the Dominion Coal Co., Sydney, N.S., for the ten months ending October last, were 2,376,633 tons. For the same period last year the shipments were 2,436,667 tons. These figures show a decrease for the present year of 60,034 tons. This is accounted for by the fire at Dominion No. 1. The shipments of the Nova Scotia Steel & Coal Co. show an increase over last year.

A press despatch from Collingwood, Ont., dated the 20th inst., says:—As the result of the issuing of a writ by the American Trust Company against the Cramp Steel Company, the works and head office of which are located here, have been intirely closed down. No definite information regarding the company's situation can be learned, Major J. A. Currie, the secretary of the

company, being absent in Toronto, but in a letter to some friends in town Major Currie stated that the issuance of the writ was due to hasty action on the part of the American company, and expresses the assurance that the company will be placed on a sound financial basis within a short time. The company already has expended a large sum of money here in buildings and plant, the former being of a most substantial nature, while the later is described by competent engineers to be unequalled by any in America.

Ore shipments from Boundary mines for the week ending Dec. 12th, 1903, and year to the same date, in tons, were as follows:—

|                  | Week   | Year    |
|------------------|--------|---------|
| Granby.....      | 11,018 | 358,524 |
| Mother Lode..... | 2,688  | 123,812 |
| Snowshoe.....    | 1,500  | 73,432  |
| Emma.....        | 297    | 20,546  |
| B. C.....        |        | 19,365  |
| Sunset.....      | 90     | 15,671  |
| Oro Denoro.....  | 528    | 14,153  |
| Athelstan.....   | 210    | 4,726   |
| Morrison.....    |        | 3,339   |
| Winnipeg.....    |        | 2,435   |
| Providence.....  |        | 910     |
| Elkhorn.....     |        | 213     |
| Senator.....     | 33     | 66      |
| Totals.....      | 16,064 | 653,762 |

The following figures taken from a recent report issued by the Director of the United States mint, shew the value of the gold and silver production during 1902 of the leading mining countries so far as the precious metals are concerned. As will be noticed Canada's gold production comes fourth on the list, being credited with an output of \$20,741,200:—

|                    | Gold.        | Silver.      |
|--------------------|--------------|--------------|
| United States..... | \$80,000,000 | \$71,575,575 |
| Australia.....     | 81,578,800   | 10,377,100   |
| Mexico.....        | 10,153,100   | 77,804,100   |
| Canada.....        | 20,741,200   | 5,564,500    |
| Africa.....        | 39,023,700   |              |
| Spain.....         | 10,200       | 4,784,100    |
| Greece.....        |              | 1,409,500    |
| Columbia.....      | 2,532,600    | 2,297,000    |
| British India..... | 9,588,100    |              |

As compared with 1901, these figures show an increase in the production of gold of 1,572,914 ounces and a decrease of 8,042,914 ounces in the production of silver. During the year Africa increased her gold production from 439,704 ounces to 1,887,773 ounces and Australia increased her gold production to \$81,578,000, which is over a million and a half dollars in excess of the production of the United States, which again takes second place.

In a recent interview with a representative of a western exchange, Mr. Archibald Dick, Inspector of coal and metalliferous mines for East Kootenay, states that the output of coal from the Crow's Nest Pass mines was steadily increasing. The mines at Michel now turn out 1,400 tons of coal a day, and each month sees a still greater output. At Morrissey there has been considerable delay in operations during the past fortnight owing to a big mudslide which blocked the line, and which is still giving trouble. All but forty of the 220 coke ovens at the Morrissey mines are now finished and as soon as these are completed the work of turning out coke will be commenced there. At Michel about 160 of the new lot of ovens are ready, with about sixty more to complete. The electric light system, on which work has been going on at Michel for some time, was completed early this week, and the light is now turned on. The wires have been carried 500 feet into the No. 8 tunnel, which is now lit by electricity, and it is likely that further extensions will be made from time to time in the mines there.

One of the most remarkable dividend showings of the year 1903 will be that at the Daly-West mine at Park City, Utah, which (with a dividend of \$117,000 declared a few days ago) will make payments to its fortunate stockholders of \$1,332,000. This one mine has paid in dividends to date \$3,591,000, while there yet remains in the treasury the largest surplus the company has ever had. Still there are some people who will declare that all mining is a gamble.

The Pacific Coast Miner in a late issue says:—"British Columbia does not give great promise as a gold producer, but in silver, lead, copper and coal it is bound to take high rank. British Columbia's mineral wealth is vast, but is little developed up to date. Lack of capital is the principal drawback, but gradually capital is becoming aware of the great richness of that country and mines are being opened up in places that a few years ago were almost inaccessible. Enormous deposits of workable copper ores have been located."

**ONTARIO MINES OUTPUT.**—The output of the metalliferous mines and works of Ontario for the first nine months of 1903, as reported to the Bureau of Mines, was as follows:—Gold, 6,693 ozs., worth \$139,210; silver, 19,549 ozs., worth \$10,124; iron ore, 262,409 tons, worth \$376,102; pig iron, 59,783 tons, worth \$1,541,940; nickel, 5,393 tons, worth \$2,116,957; copper, 3,911 tons, worth \$330,263; zinc ore, 950 tons, worth \$7,600. Total value, \$4,030,197.

**NEW YUKON DIVISIONS.**—According to a proclamation issued by the Yukon government, the Yukon country is divided into nine districts, for the sake of more convenient administration. Each of the new districts will be a fully constituted mining sub-division, with a gold commissioner and a record office of its own. The names of the districts are: Forty Mile, Sixty Mile, Stewart, Clear Creek, Duncan Creek, Dawson, Pelly, Hootalinqua, and Whitehorse. Besides keeping the mining records the gold commissioners and their deputies will have to take charge of the land offices and timber inspector, in fact, transact all the clerical work which is now in the most cases taken to Dawson. The change meets with approval in the Yukon country.



**Mineral Fuel.**

The imports of mineral fuel into Canada, in the fiscal year ending June 30, 1903 and the value thereof, were as follows :

|                           | Tons.     | Value.       |
|---------------------------|-----------|--------------|
| Bituminous and slack..... | 3,862,295 | \$8 197,034  |
| Anthracite.....           | 1,456,713 | 7,028,664    |
| Coke.....                 | 256,723   | 1,222,756    |
| Totals.....               | 5,575,731 | \$16,448,454 |

These imports were the output of mines chiefly in the states of West Virginia, Pennsylvania, Ohio, Indiana, and Illinois. The imports from all other countries, chiefly Great Britain, were as follows :

|                           | Tons    | Value.    |
|---------------------------|---------|-----------|
| Bituminous and slack..... | 69,779  | \$22,884  |
| Anthracite and slack..... | 62,038  | 345,015   |
| Coke.....                 | 15,638  | 70,469    |
| Totals.....               | 147,455 | \$636 358 |

The duty upon bituminous coal is 53 cents per ton of 2,000 pounds and upon bituminous slack 20 per cent, but not to exceed 13 cents per ton. No duty is imposed upon either anthracite or coke.

Substantially all of the bituminous coal and slack imported into Canada from the United States finds entrance through ports in Ontario, in which province it finds its greatest consumption, the supply for Manitoba reaching through Port Arthur. And this is true also regarding anthracite and coke, there being a much smaller demand in Montreal. The demand for mineral fuel in the province of Quebec is supplied almost entirely from Nova Scotia mines; and that for the mountainous sections of the Far West and of British Columbia from the mines in that province. Ontario is the largest consumer of mineral fuel, but is not a producer.

Canada, however, is an exporter of bituminous coal, our exports in 1903 being as under :—

|                      | Tons.     | Value.      |
|----------------------|-----------|-------------|
| Great Britain.....   | 25,335    | \$92,119    |
| United States.....   | 1 719,027 | 4,640,064   |
| Newfoundland.....    | 126,169   | 330,054     |
| Other countries..... | 109,420   | 390,197     |
| Totals.....          | 1,079,951 | \$5,452,434 |

These exports were almost entirely the output of Nova Scotia mines, 83 per cent. of which were to the New England states for consumption in industrial establishments there, and upon which, at present, no United States duty is imposed.

**Gold and Manganese Mining in British Columbia.**

Consul L. Edwin Dudley, writes from Vancouver, B.C., under date of August 13, 1903, as follows :—

I have recently visited Atlin, British Columbia, and vicinity. This district is very rich in gold, and there are large hydraulic plants being established there, some of which are already producing gold in very considerable quantities. There is one dredging plant in process of construction; it is expected that it will be in operation before the close of the present season. This dredging plant is the first that I have seen building in the interior. It is quite a different operation from dredging work on the bars of rivers which I have seen heretofore. A large basin is excavated, in which the dredge is built. A ditch, 7 miles long, brings water with which to fill this basin and float the dredge when completed. This will also furnish power to develop electricity to operate the machinery on the dredge. The advocates of the dredge proposition think it superior to the ordinary hydraulic work, for the earth that has been washed fills up the space immediately in the rear and is not thrown down into the stream, as is the case with the hydraulic companies. This dredge is expected to dig into the benches and make its way, leaving the ground very much as it found it, except that it will have extracted the gold.

The Atlin gold is generally not as fine as is found in the beds of streams in other districts. There are some individual miners who seem to be doing well in this district, but it does not appear to me to be a country in which men with small capital can do very much, but at the present time wages are very high. The ordinary pick-and-shovel men are paid \$3.50 per day and board, and their expenses into the country in the spring of the year and out again in the autumn are paid by their employers, and they can save nearly everything they earn if they are pleased to do so.

Returning to Atlin after a visit to one of the creeks, I noticed a great

**LAURIE ENGINE COMPANY**

MONTREAL - - CANADA

**IMPROVED****CORLISS**

SIMPLE

COMPOUND

VERTICAL

HORIZONTAL

**ENGINES****FOR ELECTRIC LIGHT and POWER PLANTS.**



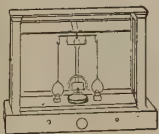
bank, which at first seemed like snow; upon a little further examination I thought it was alkali, such as I have often seen in New Mexico and other places in the Southwest. On inquiry I found that it was manganese. One gentleman told me that he had investigated this great deposit and had dug down 15 feet through a pure body of manganese. It appears almost like potters' clay of the finest quality. I was assured that there are unlimited quantities of this mineral in the vicinity of Atlin, but the present freight rates make it impossible to deliver this to the iron manufacturers at a profit. I have very little doubt that the time will soon come when this will be a very valuable deposit, one to be developed at great profit; today it appears to be valueless. It is my opinion that some of our manufacturers of steel in the United States would do well to investigate this large deposit of manganese.

There are new mines being discovered in the vicinity of Atlin constantly, and I believe that, this will eventually become one of the largest mining districts on this coast, but, as I have previously said, it will require large capital for its development. At the present time there are five hydraulic propositions under development. Three of these are now sending out gold frequently, which I am informed is secured at a price which yields good profit on the investments. There are others under process of development that are expected to be in operation before the end of the present season or, at least, early next year.—*Mines and Minerals.*

### Famous Old Spanish Mines.

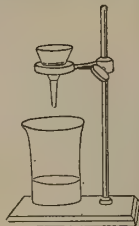
The famous mines of Potosie, Bolivia, were discovered by the Spaniards in 1535. It is a mountainous district, about 18 miles in circuit, and three miles above the sea level. During the first 10 yards the workings were small and desultory. Systematic working commenced in 1545. From 1545 to 1547 it was considered a bad month when the mines failed to yield 1,500,000 dols. From 1548 to 1551 the product fell below 1,000,000 dols. a month. From 1556 to 1578 the average annual product was 2,000,000 dols.; from 1579 to 1736 the average annual product rose to about 3,000,000 dols.; from 1537 to 1739 it fell to 2,500,000 dols.; from 1535 to 1789 the estimated product was 788,000,090 dols. This enormous total records one of the greatest productions ever made by a single district.

## ASSAYERS SUPPLIES CHEMICAL APPARATUS



Prospectors' Outfits Fine Chemicals  
Miners' Outfits Heavy Chemicals

Correspondence invited.  
Prompt deliveries.



### The Chemists & Surgeons Supply Co. Ltd.

CHAS. L. WALTERS (12 years with Lyman Sons) Manager

818 Dorchester St.

MONTREAL.



# Canadian Mining Institute

INCORPORATED BY ACT OF PARLIAMENT 1898

### AIMS AND OBJECTS.

(A) To promote the Arts and Sciences connected with the economical production of valuable minerals and metals, by means of meetings for the reading and discussion of technical papers, and the subsequent distribution of such information as may be gained through the medium of publications.

(B) The establishment of a central reference library and a headquarters for the purpose of this organisation.

(C) To take concerted action upon such matters as effect the mining and metallurgical industries of the Dominion of Canada.

(D) To encourage and promote these industries by all lawful and honourable means.

### MEMBERSHIP.

MEMBERS shall be persons engaged in the direction and operation of mines and metallurgical works, mining engineers, geologists, metallurgists, or chemists, and such other persons as the Council may see fit to elect.

STUDENT MEMBERS shall include persons who are qualifying themselves for the profession of mining or metallurgical engineering, students in pure and applied science in any technical school in the Dominion, and such other persons, up to the age of 25 years, who shall be engaged as apprentices or assistants in mining, metallurgical or geological work, or who may desire to participate in the benefits of the meetings, library and publications of the Institute. Student Members shall be eligible for election as Members after the age of 25 years.

### SUBSCRIPTION.

|                                  |         |
|----------------------------------|---------|
| Members yearly subscription..... | \$10 00 |
| Student Members do .....         | 2 00    |

### PUBLICATIONS.

Vol. I, 1898, 66 pp., out of print.  
Vol. II, 1899, 285 pp., bound red cloth.  
Vol. III, 1900, 270 pp., " "  
Vol. IV, 1901, 333 pp., " "  
Vol. V, 1902, 700 pp., " "  
Vol. VI, 1903, 600 pp., now in press.

Membership in the Canadian Mining Institute is open to everyone interested in promoting the profession and industry of mining without qualification or restrictions.

Forms of application for membership, and copies of the Journal of the Institute, etc., may be obtained upon application to

B. T. A. BELL, Secretary,  
Orme's Hall, Ottawa

# MORRIS MACHINE WORKS

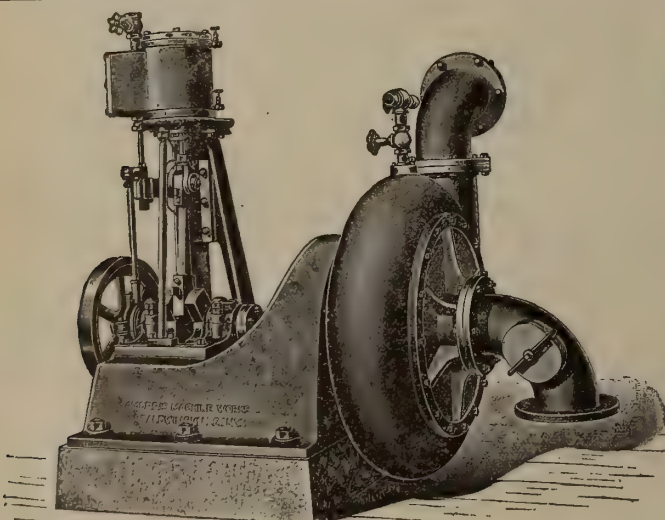
BALDWINVILLE, N.Y.

Centrifugal Pumping Machinery for various Industrial Purposes

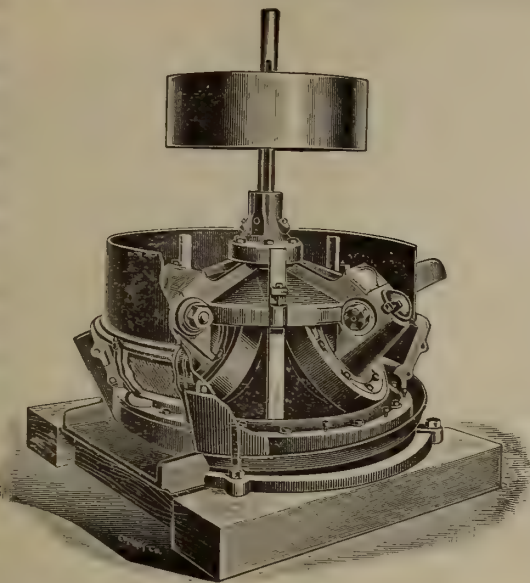
We are building a special solid steel lined pump for handling tailings or slimes in gold mining. Estimates furnished upon application for pumping outfits for special purposes. Write for catalogue. New York office—39-41 Cortlandt St.

### AGENCIES—

Henion & Hubbell, 61-69 North Jefferson St., Chicago, Ill.  
Harron, Rickard & McCone, San Francisco, Cal.  
Zimmerman-Wells-Brown Co., Portland, Oregon.  
Mitchell, Lewis & Staver Co., Seattle, Washington.







# THE GRIFFIN

## THREE ROLLER

# ..ORE MILL..

The Griffin Three Roller Ore Mill is a simply constructed Mill, suitable for working all kinds of ores that require uniformly fine crushing by the wet process. This Mill is a modification of the well-known Chilian Mill, but the rollers run upon a crushing ring or die, which is inclined inwardly at an angle of about 30 degrees, the rollers themselves also being inclined to the central shaft of the Mill, thus utilizing the centrifugal force, as well as the weight of the rollers themselves as a crushing agent. The Griffin Three Roller Ore Mill is therefore a Mill of great strength, and has few wearing parts. We construct these Mills, with extreme care, using only the best of raw materials, which are most carefully worked by men who are specialists as mill builders. We sell the Griffin Ore Mill on its determined merits, and will gladly supply full information regarding it to any one.

Send for free illustrated and descriptive catalogue to

**Bradley Pulverizer Co.** BOSTON, MASS.

## POGSON, PELOUBET & CO.

### PUBLIC ACCOUNTANTS

NEW YORK - - - 20 Broad Street  
CHICAGO - - - Marquette Building  
ST. LOUIS - - - Chemical Building  
BUTTE - - - Hennessy Building

Audits of Books and Accounts,  
Systems of Bookkeeping or Costs,  
Financial Examinations, Etc.

Are You Confronted with a  
Difficult Ore-Separating Problem?

### THE WETHERILL MAGNETIC SEPARATING PROCESS

May Prove the Solution

...APPLY TO...

**WETHERILL SEPARATING CO.,** 52 Broadway, New York

Manufacturing Agents for Canada, **ROBERT GARDNER & SON,** Montreal, P.Q.

New York Office—Cooper, Hewitt & Co., 17 Burling Slip.



CABLE  
HOIST-  
CONVEYORS

Cable Hoist-conveyer,  
Built for the U. S. Government,  
at Lamoille, Minn.

MANUFACTURED BY  
**THE TRENTON IRON CO**  
TRENTON, N. J.

ENGINEERS AND CONTRACTORS AND SOLE LICENSEES IN NORTH  
AMERICA FOR THE BLEICHERT SYSTEM OF WIRE ROPE TRAMWAYS, ALSO  
WIRE ROPE EQUIPMENTS FOR SURFACE AND UNDER GROUND HAULAGE.  
ILLUSTRATED BOOK UPON APPLICATION.

Chicago Office—1114 Monadnock Building.



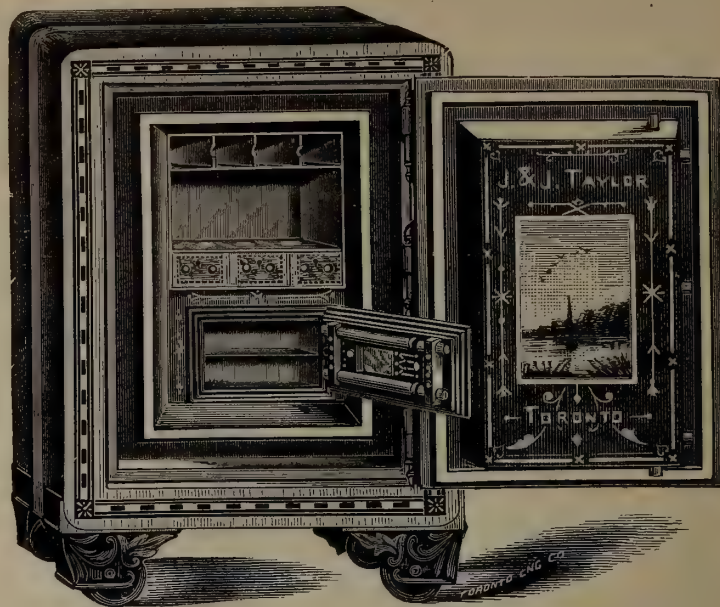
# J. & J. TAYLOR

(TORONTO SAFE WORKS)

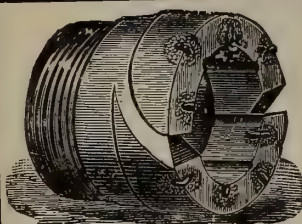
TORONTO, ONTARIO

MANUFACTURERS OF

**Bankers' Steel Safes  
Fireproof Safes  
Jewellers' Safes  
Vault Doors  
Prison Work, &c.**



THIS CUT SHOWS SUITABLE SAFE  
FOR MINING COMPANIES



GOODS SENT SUBJECT TO APPROVAL

## BERNARD BANDLER

IMPORTER OF

## CARBONS AND BORTS

For Diamond Drills and all Mechanical Purposes

65 Nassau Street, NEW YORK, N.Y.



## ADAMANTINE SHOES & DIES ALSO CHROME CAST STEEL.

THE CANDA PATENT SELF-LOCKING CAM

TAPPETS, BOSSES, ROLL SHELL and CRUSHER PLATES.

Also Rolled Parts for Huntington and other Mills.

These castings are extensively used in all the Mining States and Territories throughout the World. Guaranteed to prove better and cheaper than any others. Orders solicited subject to above conditions. When ordering send sketch with exact dimensions. Send for Illustrated Catalogue to

## CHROME STEEL WORKS, BROOKLYN, N.Y., U.S.A.

KENT AVENUE, KEAP  
AND HOOPER STREETS.

F. E. CANDA, President.

C. J. CANDA, Vice-President.

F. MORA CANDA, Secretary.

T. I. JONES, Treasurer.



Canda Cam.

## The Lunkenheimer "CLIP" Gate Valve

SINGLE DISC, DOUBLE SEATED

In Screw Ends, from 1/2 to 6-Inch Sizes.  
In Flange Ends, from 2 to 6-Inch Sizes.

Best in quality, lowest in price, the engineer's favorite. These Valves are made of cast iron and all wearing parts of gun metal. They are superior to common, cheap brass valves. Why? Because they possess all the advantages of a cast-iron pipe fitting, are heavy and rigid—not injured by expansion and contraction or rough handling in pipe fitting. Take pressure from either end. Body and hub held together by a steel clip, consequently always easily taken apart. Joint between body and hub made permanent by an imbedded seamless oval copper wire washer. If you desire the best, strongest and most durable valve for general purposes, on all ordinary pressures, use this valve. Fully warranted to satisfy. Made also in All Iron for Cyanide and other acids. Specify them and order through your dealer. Write for catalogue. Sole Makers and Patentees,

**THE LUNKENHEIMER COMPANY,  
Main Offices and Works: CINCINNATI, OHIO, U. S. A.  
BRANCHES: New York, 26 Cortlandt St., London, 35 Great Dover St.**



## C. L. BERGER & SONS

37 William Street  
BOSTON, Mass.

SUCCESSORS TO  
BUFF & BERGER.

**SPECIALTIES:**  
Standard Instruments  
and Appliances for  
Mining, Subway,  
Sewer, Tunnel,  
and all kinds of  
Underground Work

SEND FOR CATALOGUE





# DOMINION OF CANADA

## SYNOPSIS OF REGULATIONS

### For Disposal of Minerals on Dominion Lands in Manitoba, the North-West Territories, and the Yukon Territory.

#### COAL.

Coal lands may be purchased at \$10.00 per acre for soft coal, and \$20.00 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at such rate as may from time to time be specified by Order-in-Council shall be collected on the gross output.

#### QUARTZ.

Persons of eighteen years and over and joint stock companies holding Free Miner's certificates may obtain entry for a mining location.

A Free Miner's Certificate is granted for one or more years, not exceeding five, upon payment in advance of \$10.00 per annum for an individual, and from \$50.00 to \$100.00 per annum for a company, according to capital.

A Free Miner having discovered mineral in place may locate a claim 1500 x 1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the line of the lode or vein.

The claim shall be recorded within fifteen days if located within ten miles of a Mining Recorder's Office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5.00.

At least \$100.00 must be expended on the claim each year or paid to the Mining Recorder in lieu thereof. When \$500.00 has been expended or paid the locator may, upon having a survey made and upon complying with other requirements, purchase the land at \$1.00 per acre.

Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper in the Yukon Territory, of an area not exceeding 160 acres.

The patent for a mining location shall provide for the payment of royalty on the sales not exceeding five per cent.

#### PLACER MINING, MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

Placer mining claims generally are 100 feet square; entry fee, \$5.00, renewable yearly. On the North Saskatchewan River claims are either bar or bench, the former being 100 feet long and extending between high and low water mark. The latter includes bar diggings, but extends back to the base of the hill or bank, but not exceeding 1,000 feet. Where steam power is used, claims 200 feet wide may be obtained.

#### DREDGING IN THE RIVERS OF MANITOBA AND THE N.W.T., EXCEPTING THE YUKON TERRITORY.

A Free Miner may obtain only two leases of five miles each for a term of twenty years, renewable in the discretion of the Minister of the Interior.

The lessee's right is confined to the submerged bed or bars of the river below low water mark, and subject to the rights of all persons who have, or who may receive entries for bar diggings or bench claims, except on the Saskatchewan River, where the lessee may dredge to high water mark on each alternate leasehold.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles, but where a person or company has obtained more than one lease one dredge for each fifteen miles or fraction is sufficient. Rental \$10.00 per annum for each mile of river leased. Royalty at the rate of two and a half per cent., collected on the output after it exceeds \$10,000.00.

#### DREDGING IN THE YUKON TERRITORY.

Six leases of five miles each may be granted to a free miner for a term of twenty years, also renewable.

The lessee's right is confined to the submerged bed or bars in the rivers below low water mark, that boundary to be fixed by its position on the 1st day of August in the year of the date of the lease.

The lessee shall have one dredge in operation within two years from the date of the lease, and one dredge for each five miles within six years from such date. Rental, \$100.00 per mile for first year, and \$10.00 per mile for each subsequent year. Royalty ten per cent on the output in excess of \$15,000.00.

#### PLACER MINING IN THE YUKON TERRITORY.

Creek, Gulch, River, and Hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being from 1,000 to 2,000 feet. All other Placer claims shall be 250 feet square.

Claims are marked by two legal posts, one at each end bearing notices. Entry must be obtained within ten days if the claim is within ten miles of Mining Recorder's office. One extra day allowed for each additional ten miles or fraction.

The person or company staking a claim must hold a Free Miner's certificate.

The discoverer of a new mine is entitled to a claim 1,000 feet in length, and if the party consists of two, 1,500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only.

Entry fee \$15.00. Royalty at the rate of 2½ per cent. on the value of the gold shipped from the Territory to be paid to the Comptroller.

No Free Miner shall receive a grant of more than one mining claim on each separate river, creek, or gulch, but the same miner may hold any number of claims by purchase, and Free Miners may work their claims in partnership, by filing notice and paying fee of \$2.00. A claim may be abandoned and another obtained on the same creek, gulch, or river, by giving notice, and paying a fee.

Work must be done on a claim each year to the value of at least \$200.00, or in lieu of work payment may be made to the Mining Recorder each year for the first three years of \$200.00, and after that \$400.00 for each year.

A certificate that work has been done or fee paid must be obtained each year; if not, the claim shall be deemed to be abandoned, and open to occupation and entry by a Free Miner.

The boundaries of a claim may be defined absolutely by having a survey made, and publishing notices in the *Yukon Official Gazette*.

#### HYDRAULIC MINING, YUKON TERRITORY.

Locations suitable for hydraulic mining, having a frontage of from one to five miles, and a depth of one mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent; is found to be unsuitable for placer mining; and does not include within its boundaries any mining claims already granted. A rental of \$150.00 for each mile of frontage, at the rate of 2½ per cent. on the value of the gold shipped from the Territory. Operations must be commenced within one year from the date of the lease, and not less than \$5,000.00 must be expended annually. The lease excludes all base metals, quartz, and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes.

#### PETROLEUM.

All unappropriated Dominion Lands shall, after the first of July, 1901, be open to prospecting for petroleum. Should the prospector discover oil in paying quantities he may acquire 640 acres of available land, including and surrounding his discovery, at the rate of \$1.00 an acre, subject to royalty at such rate as may be specified by Order in Council.

**JAMES A. SMART,**

Deputy of the Minister of the Interior.

OTTAWA, 9th Dec., 1901.



# PROVINCE of QUEBEC

The attention of Miners and Capitalists in the United States  
and in Europe is invited to the

## GREAT MINERAL TERRITORY

Open for investment in the Province of Quebec.

Gold, Silver, Copper, Iron, Asbestos, Mica, Plumbago,  
Phosphate, Chromic Iron, Galena, Etc.

ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been  
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals\* ; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein ; in concessions for the mining of the inferior metals, those only may be mined for.

\*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals ; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms :—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100 ; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds : Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more ; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE MINISTER OF LANDS, MINES AND FISHERIES,  
PARLIAMENT BUILDINGS, QUEBEC, P. Q.



# Ontario's Mining Lands..

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite : copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zincblende, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc, apply to

**HONORABLE E. J. DAVIS,**

Commissioner of Crown Lands,

or

**THOS. W. GIBSON,**

Director Bureau of Mines,

Toronto, Ontario.





# PROVINCE OF NOVA SCOTIA.

## Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

## PRECIOUS STONES.

---

TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

---

### GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required

to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19 an ounce, and on smelted Gold valued at \$18 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province, he may stake out the boundaries of the areas he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

### MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars, for minerals other than Gold and Silver, out of which areas can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department for a nominal fee, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties, makes the royalties first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists, who have always stated that the Mining laws of the Province were the best they had had experience of.

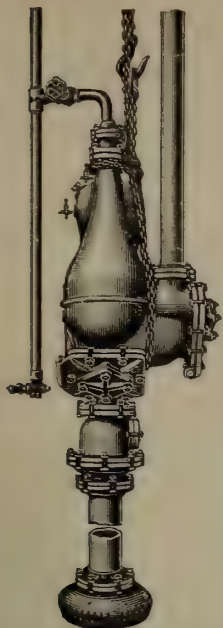
The royalties on the remaining minerals are: Copper, four cents on every unit; Lead, two cents upon every unit; Iron, five cents on every ton; Tin and Precious Stones, five per cent.; Coal, 10 cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast, and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the Counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the Island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

**THE HON. A. DRYSDALE,**  
Commissioner Public Works and Mines,  
HALIFAX, NOVA SCOTIA.





# The Pulsometer-

PULSOMETER ENGINEERING CO., Limited, READING, ENGLAND

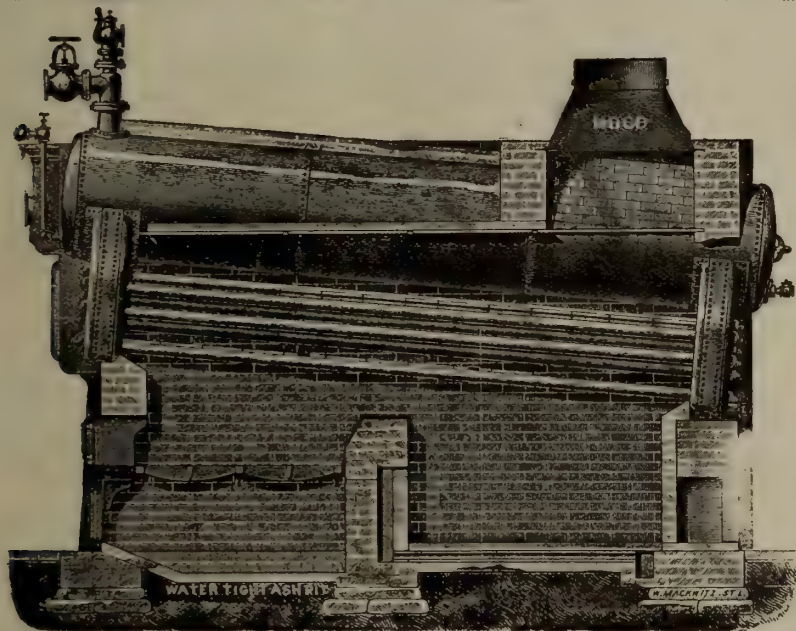
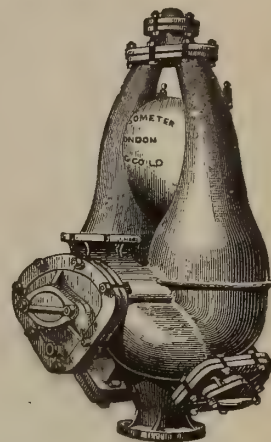
**1,000 TO 100,000 GALLONS PER HOUR**

PUMPS ALMOST ANYTHING

**NOISELESS. NOT AFFECTED BY WEATHER.  
NO SKILLED LABOR REQUIRED.  
MOST ECONOMICAL AND BEST MADE.  
NO EXHAUST STEAM. SIMPLE. DURABLE.**

**PEACOCK BROTHERS**

SOLE CANADIAN REPRESENTATIVES  
CANADA LIFE BLDG., MONTREAL

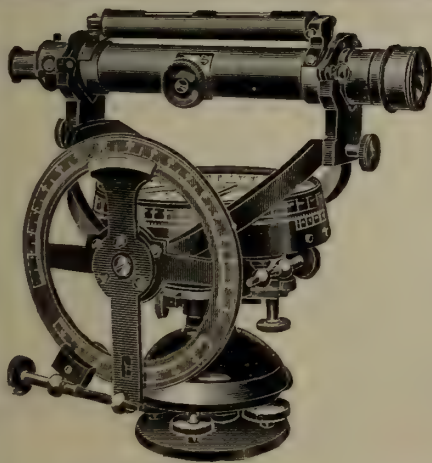


## HEINE SAFETY BOILER

MANUFACTURED BY

**The Canadian Heine Safety Boiler Co.**  
TORONTO, ONT.

**THE HEINE SAFETY BOILER**—Made in units of 100 to 500 h.p., and can be set in batteries of any number. Suitable for Mines, Pulp Mills, Water and Electric Installations, and large plants generally. The best and most economical boiler made.



### COMBINED THEODOLITE AND MINING DIAL

Quick Levelling Head.  
Reading 90° up and down.

GUN METAL - - Price £25.  
CODE WORD - - Atavism.

ALUMINIUM - - Price £30.  
CODE WORD - - Ataxy.

Stanley's Patent Mine Staff, 6 feet, closing to 20 inches, very portable. . . . . £2 5s.  
CODE WORD - - Element.

### Mathematical, Drawing, and Surveying Instruments

Of every description, of the highest Quality and Finish, at the most moderate Prices.

SPECIALTY FOR MINING SURVEY INSTRUMENTS.

PRICE LIST, POST FREE.

Address—**W. F. STANLEY & CO. Ltd.**

GREAT TURNSTILE, HOLBORN, LONDON, W.C., ENG.

Telegrams—"TURNSTILE, LONDON."

Gold Medals, Inventions Exhibitions, 1885, and Mining Exhibition, 1890.

## SPRINGHILL COAL.

**The Cumberland Railway & Coal Company**

Are prepared to deliver this well known Steam Coal at all points on the lines of G. T. R., C. P. R. and I. C. Railways.

**Head Office: 107 ST. JAMES STREET, MONTREAL**

Address: P. O. BOX 396.



# One Man <sup>Can handle</sup> 1200 TONS <sup>per day with a</sup> Riblet Patent Automatic Aerial Tramway



YOU CAN FIGURE  
THE COST PER TON

More Riblet Tramways are now being  
installed than of all the other  
systems combined

WRITE FOR DESCRIPTION  
AND PRICES

**B. C. RIBLET, ENGR.**  
SPOKANE, Wash.  
NELSON, B.C.

ESTABLISHED 1857

**WIRE ROPE** OF EVERY DESCRIPTION  
FOR  
MINES, QUARRIES,  
ELEVATORS, DREDGES,  
LOGS, SAW MILLS ETC.

**AERIAL WIRE ROPE  
TRAMWAYS**

SINGLE & DOUBLE  
ROPE SYSTEMS

**A. LESCHEN & SONS ROPE CO.**

BRANCH OFFICES  
& WAREHOUSES  
NEW YORK 102 CENTRE ST.  
CHICAGO 1157 C. LAKE ST.  
DENVER 1712 S. WABASH ST.  
SAN FRANCISCO 1140 BULL  
ST. LOUIS 1111 N. 1ST ST.  
PORTLAND 1111 N. 1ST ST.

LESCHEN'S TRAMWAY AT ENCAMPMENT, WYO. LONGEST IN THE COUNTRY.

## Canada Atlantic Ry.

THE SHORT FAVORITE ROUTE

BETWEEN

**Ottawa and Montreal.**

Sunday Train Both Directions

PULLMAN BUFFET PARLOR CARS

Close Connections at Montreal with Trains for

**Quebec, Halifax, Portland**

And all Points EAST and SOUTH.

FAST THROUGH SERVICE BETWEEN

**Ottawa, New York and Boston**

And all NEW ENGLAND POINTS

Through Buffet Sleeping Cars between Ottawa and New York

Baggage checked to all points and passed by customs in transit.  
For tickets, time tables and information, apply to nearest ticket  
agent of this company or connecting lines.

**W. P. HINTON,**  
Gen'l Passenger Agent.

## ANNUAL CONVENTION

OF

**Canadian Mining Engineers and  
Mine Managers**

TO BE HELD UNDER THE AUSPICES OF

## THE CANADIAN MINING INSTITUTE

will be held in the King Edward Hotel,  
City of Toronto, on

**WEDNESDAY, THURSDAY and FRIDAY,**  
**2nd, 3rd and 4th MARCH, 1904.**

Special Excursion on 6th March to Niagara Falls, visiting Power  
Plants and Electro-Metallurgical Works.

**SINGLE FARE TO ALL MINING MEN ON CANADIAN RAILWAYS.**

Among the contributors of papers are the following :—

Dr. Eugene Haanel, Dominion Superintendent of Mines; Prof.  
Miller, Mr. James McEvoy, Mr. Eugene Coste, E.M., Mr. A. J.  
Beaudette, Mr. J. N. S. Williams, Mr. C. A. Meisner, Mr. W. M.  
Brewer, Dr. Ami, Mr. Wm. Thompson, Mr. F. T. Snyder, Mr. D. G.  
Kerr, Mr. W. E. H. Carter, Mr. E. D. Ingall, Mr. L. J. Robe, Mr.  
E. B. Kirby, Mr. F. Keffer, and others.

**OFFICIAL PROGRAMME LATER.**

**EUGENE COSTE,**  
PRESIDENT.

**B. T. A. BELL,**  
SECRETARY.



CONTRACTORS TO H. M. GOVERNMENT

# Allan, Whyte & Co.

CLYDE PATENT WIRE ROPE WORKS

Rutherglen, Glasgow, Scotland

MANUFACTURERS OF

## WIRE ROPES for Collieries, Mines, Aerial Tramways

Transmission of Power, Logging and general Hauling and Hoisting Purposes.

Wire specially selected for own exclusive use.

We have made many records with our Winding, Haulage and Crane Ropes.

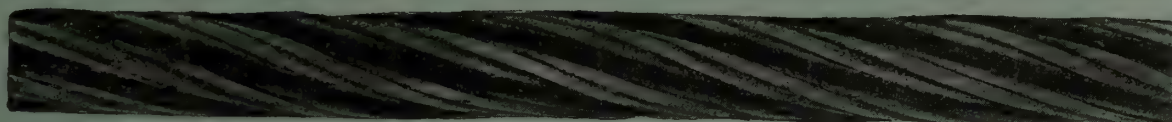


Illustration of  $\frac{3}{4}$ " diam. Special Improved Patent Steel Wire Rope, 1760 yards long, supplied to Dalzell Colliery, Motherwell, Scot., which ran two years and 8 months, shewing condition when taken off. Previous rope from another maker lasted 1 year and 9 months

TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

### AGENTS IN CANADA:

Wm. Stairs, Son & Morrow Ltd., Halifax, N.S.  
W. H. Thorne & Co. Ltd., Saint John, N.B.

Drummond, McCall & Co., Montreal.  
John Burns, Vancouver, B. C.

## Drummond, McCall & Co.

IRON, STEEL and GENERAL METAL MERCHANTS

GENERAL SALES AGENTS

Algoma Steel Co. Ltd., Sault Ste. Marie, Ont.

AND IMPORTERS OF

Beams, Channels, Angles and other Structural Material.

Steel Plates—Tank, Boiler and Firebox Quality.

Cold Rolled Steel Shafting.

Mild Steel Bars—all diameters.

Wire Rope. Snow Steam Pumps. Tool Steel.

....COMPLETE STOCK KEPT IN MONTREAL....

General Offices: CANADA LIFE BUILDING - MONTREAL.

Montreal Pipe Foundry Co. Limited

MANUFACTURERS OF

CAST IRON  
WATER AND GAS

**PIPE**

and other Water Works Supplies.

"LUDLOW" VALVES & HYDRANTS

GENERAL OFFICES:

Canada Life Building - MONTREAL

## PIG IRON...

"C.I.F." Charcoal Pig Iron, also  
"Midland" Foundry Coke Pig Iron

MANUFACTURED BY

CANADA IRON FURNACE COMPANY, LIMITED

Plants at { RADNOR FORGES, QUE., and  
MIDLAND, ONT.

GENERAL OFFICES

CANADA LIFE BUILDING, MONTREAL.

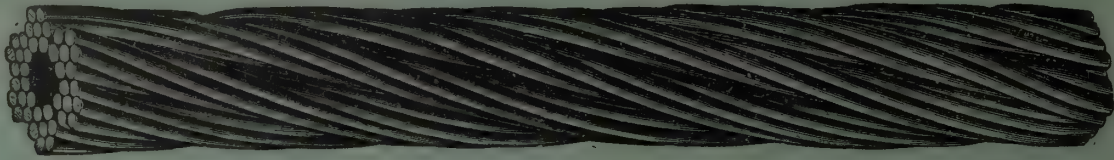
Geo. E. Drummond, Managing Director and Treasurer.



# THE DOMINION WIRE ROPE CO. LIMITED

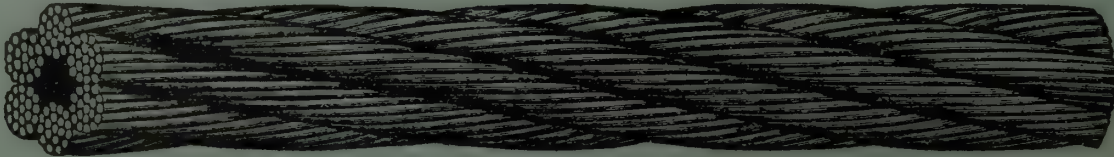
MONTREAL, CAN.

Manufacturers of "LANG'S" PATENT WIRE ROPES



FOR COLLIERY AND GENERAL  
MINING PURPOSES.

ALSO BEST STEEL WIRE ROPES  
FOR ALL PURPOSES.



ALSO

SOMETHING  
NEW...



SOMETHING  
TO LAST...

The Wearing Surface of Hemp.

The Strength of Wire.

The Flexibility of Manila.

UNEXCELLED FOR TRANSMISSION AND PILE DRIVING PURPOSES

BRANCH OFFICES: Vancouver, B.C.  
Rossland, B.C.

Winnipeg, Man.  
Toronto, Ont.

Ottawa, Ont.  
Halifax, N.S.

CATALOGUE ON  
APPLICATION.

## MINING AND CONTRACTORS' RAILS ...

RELAYING RAILS 30 lbs., 45 lbs., 56 lbs., 65 lbs. per Yard

IMMEDIATE SHIPMENT.

### LIGHT MINING RAILS

12 lbs., 18 lbs., 25 lbs., 30 lbs., per Yard

..IN STOCK..

**COOPER**

ORE

AND

..Mining Cars..

WHEELBARROWS ALL  
KINDS

SPECIAL ORE BARROWS

Charging Barrows

PICKS, SHOVELS, HAMMERS, TOOLS, ETC., ETC.

Barrett Jacks.

Car Movers.

ENGLISH OCTAGON DRILL STEEL CARRIED IN STOCK...

**JAMES**

Office : 299 ST. JAMES ST., MONTREAL.

CATALOGUE  
ON  
APPLICATION



















Return to  
**LIBRARY**  
DEPARTMENT  
~~~~~  
NATIONAL BUSINESS
PUBLICATIONS LIMITED

